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FIREPROOF

MAGAZINE

VOLUME VI

JANUARY TO JUNE, INCLUSIVE

1905

FIREPROOF PUBLISHING COMPANY
GREAT NORTHERN BUILDING
CHICAGO

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JANUARY

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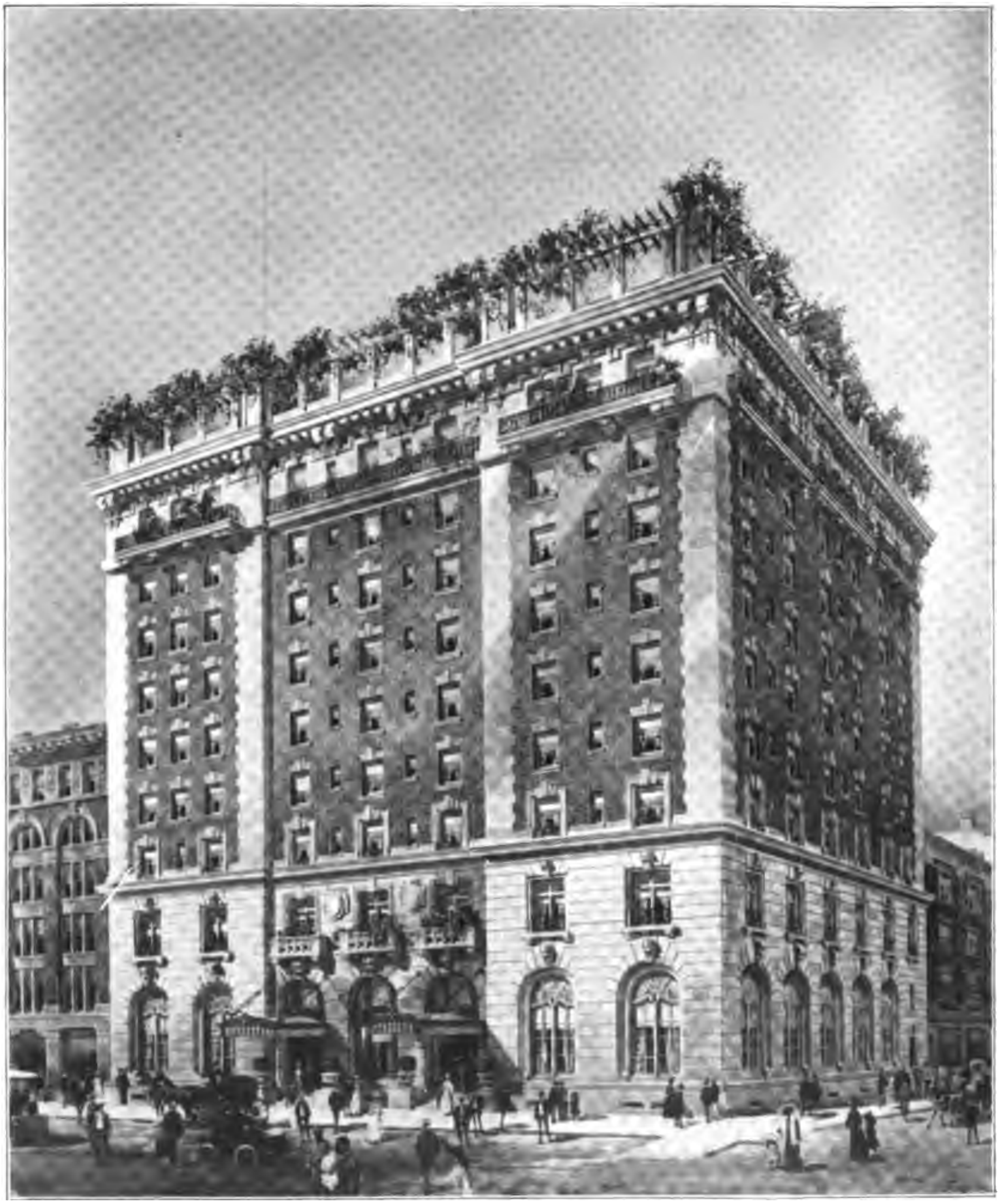

THE NEW SEELBACH FIREPROOF HOTEL, LOUISVILLE.

Frank M. Andrews, Dayton, O., and W. J. Dodd, Louisville, Ky., Associated Architects. Herman Probst, General Contractor.

FIREPROOF MAGAZINE

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FIREPROOF MAGAZINE begins the year 1905 with the same confidence in the success of its object as that with which it was born. It gave forth no flourish of what it expected to accomplish when first issued, and makes no promises now. It only claims to have been progressive from the start, and of this its latest issues, it is hoped, will bear evidence to those who have seen them.

This journal is one of the very few that have ever appeared and been properly sustained that have A PURPOSE. If it is a laudable one its SUCCESS will prove it. It seeks only to reduce the deplorable loss of property by fire which now in the United States has nearly reached the astounding value of TWO HUNDRED MILLIONS OF DOLLARS annually. To accomplish this it desires to encourage every practicable agency, but mainly by the erection of fireproof buildings, fireproofed in the most effective manner and with reliable materials. It believes now that it is not only practicable but profitable to build ALL CLASSES OF BUILDINGS in a fireproof manner, and for evidence of this it points to the success that has attended the attempt to make ordinary dwellings fireproof, which is described in this number.

TO THE AMERICAN PEOPLE

A WORD ABOUT FIREPROOF DWELLINGS AND SIMPLE ARCHITECTURE.

In the October number of this magazine we addressed the architects, showing what their interests should be in fireproofing and the work of FIREPROOF MAGAZINE. In November we addressed the engineers, who are quite as much interested in the erection of fireproof buildings, because their planning and construction have opened for that profession an increased field of usefulness and patronage, and they have borne a large part in the development of steel construction for buildings. In December we addressed the capitalists, whose money is so largely invested in fireproof structures and without whose confidence they would be impossible.

In November, alluding to the interest of architects and engineers in FIREPROOF MAGAZINE, we also said: "If of interest to both of these professions it becomes their common meeting ground. But those who read it must also feel that it is not this alone, but the meeting ground between engineers and architects on the one hand and the large class of patrons whose investments are made in building improvements on the other, not to speak of that other large class who are, so to speak, *the observing and interested public who are always watching building operations.*" Of this "other large class" we said in December: "Every man of means may not only at some time build his own house, but may invest money in other houses, or, if fortune favors his honest efforts, may be a capitalist. He, therefore, like all the rest of us, has much to learn; and part of that which he ought to know is spread before him, as best we may do it, in these pages."

It is to the "observant public" that we now address ourselves; that class whose attention is arrested whenever a new building is seen in course of erection. They unconsciously form a class by themselves, though they do not know it. Their number is legion, and they are our friends, for in course of time they get to know a fireproof building from a fire-trap as soon as they see it. They know that it is built for a purpose—and for a good purpose—and they realize that it is to somebody's interest to build in that way, otherwise he would be throwing away money on the small extra expense, which we have in previous days demonstrated is from ten per cent upwards, according to the character and purpose of the building.

What we are trying to do in these pages is to increase the interest of the "observant public" in fireproof construction of buildings, and the articles in this magazine are nearly all of them prepared for that purpose. We give various kinds of information to assist those who may want to know more about those things which attract their attention daily. In so doing we have tried to discriminate between what is good and what is bad, but have not done so without giving substantial reasons therefor. Fortunately, bad work is only found in limited quantities and the good prevails. But we welcome any honest effort to reduce fire losses however imperfect, only reserving the right to criticise its imperfections.

It is very appropriate to the beginning of a new year and a new volume, after two and a half years of successful effort, that we should be able in this issue to describe the inauguration of a new era in fireproofing. It might be called "Fireproof houses for the people," for Mr. Henry has reduced it to an actual demonstration—as described elsewhere in this month's issue—that people of moderate means may live in fireproof houses. These houses make no pretensions of elaborate architecture. They are rather examples of "the simple architecture," well fitted for those who desire to lead "the simple life." They are unostentatious without and within, and it is better that they were so.

We have been pretty well provided of late with fireproof hotels; the wealthy have for years indulged in fireproof mansions and the poor have been provided already with many fireproof tenements, but the plain everyday man of business has until now been left out of the calculation. Now a beginning has been made, and his prospects are better.

The man who builds for himself has an example before him, and need no longer be at the mercy of the speculator who has firetraps to sell. It must not be expected that fireproof houses will be built for sale. They may be built as an investment, for renting purposes, and doubtless many investors will immediately follow the example set by Mr. Henry. But those who would build this way for themselves are advised to go to good architects and see what they can get. But we advise them to put all the cost of external elaboration into the fireproofing. This salutary advance in house building may thus be one step toward "A Simple Architecture," and ultimately the doom of the "Frenzied" architecture in which the speculative builders have so long indulged.

THE EFFICIENCY OF SPRINKLERS

We are indebted to the Canadian Architect and Builder for the substance of a report of the "General Committee of Fire Insurance Companies" of Toronto, Ontario, on the operation of sprinklers in the conflagration that occurred at Toronto last summer, which seems to give a correct account of their efficiency in business buildings during a conflagration. This is interesting, because while sprinklers are claimed to be mainly efficient in subduing initial fires, they seem to have been of some use in a conflagration according to the Toronto experience. It is generally admitted that in the Baltimore conflagration they were of no effect in retarding the fire. It could hardly have been expected to be otherwise.

According to the report the most striking suggestions for the future protection of business buildings are found in the account of the "sprinkler risks" in the warehouses of W. R. Brock & Co., Kilgour Brothers and the Evening Telegram. The two former were supplied with both inside and outside sprinklers, and the evidence seems to show their efficacy if the flow of water can be kept up in spite of the competition of the hydrants. There seems to be no doubt that in the case of W. R. Brock's building, if there had been fewer hose going, if the fire had been concerned only with its immediate neighbor, this warehouse, though exposed to precisely the same contact with fire as in the April fire, would have escaped burning; but in a conflagration which kept fifty streams of water running and reduced the pressure at the hydrants from 70 or 80 pounds per square inch to 37½ pounds, the water curtain from the outside sprinklers, which kept the fire off while pressure lasted, began to fail in the upper stories; "then," the report says, "it is supposed that the fire entered the risk through the upper windows at the rear." The automatic sprinklers inside kept the fire in check until the tank supply was exhausted, after which the supply to the upper floors ran dry inside as well as outside and the fire got possession of the building.

The account of the Kilgour building's apparatus is not so clear. It had the advantage of a larger tank supply for the inside automatic heads, and the outside heads are said to have had a steamer connection auxiliary to the supply from city pressure; but it is not said whether the steamer connection was made use of, or whether the safety of the building, and the credit which is due to it of having stopped the fire at that point is due to its superior apparatus or to the good fortune of having had as its exposing neighbor on its uninjured side, a lower building than the Brock warehouse had. One point is clear, that, where the building did take fire, its advance within was held in check by "good division walls;" but that is a precaution well known, however little used. The immediate example furnished by these buildings is the efficacy of sprinklers if their efficacy is secured, and the simplest way to secure it would be to supply these, as well as hose pipes, with water from the fire engines. It would require a point of application at a comfortable distance from the fire; not up a lane but on the street; and on the edge of the sidewalk rather than against the building.

The Telegram building, though sprinklered, did not get to the point of opening the heads. The fire was successfully fought with inside hand hose, and special mention is given to good work done with a length of hand hose attached to a roof hydrant. This sounds like a good thing to have, but not to rely upon. It is good to stop small beginnings, but the flame that reaches across a street would make short work not only of a hand hose, but of those who operate it.

The great lesson of the fire, however, according to the Canadian Architect and Builder, is one that was taught before, when the McKinnon warehouse took fire through its windows from the Globe office across the way. A building is not fire-resisting unless its windows are protected. With protected windows any brick building with fire walls and a reasonable roof would be hard for the fire to get at; without them a building may be as fireproof as a stove and burn as well. It is the stock that burns. Most stock burns well and much of it is very inflammable. There is nothing to prevent fire running through a fireproof building from front to rear, if there is nothing but glass between its stock and a fire across the road.

MORE CONFLAGRATIONS

In our October issue we noted the "lull in conflagrations" which was evident at that time, none having been recorded since the conflagration at Toronto. But it appears to have been short-lived, for the last month has been made memorable by two, one in Minneapolis and one in Sioux City. The fire fiend has evidently commenced his winter campaign early. It generally begins in January, so that if true to his previous record he will soon put in his deadly work, with the assistance of incendiaries, red hot stoves, defective flues, cotton waste and rats, to say nothing of crossed wires and other modern inventions, of which he is quick to detect their utility for his purposes.

The Sioux City conflagration was one of the ordinary kind which prevail among cheaply constructed buildings, in which no considerations are given to safety from fire, even though built to considerable height. One of them is said to have been six stories high and was probably a type of what may be found in half a hundred other rapid growing cities, in which the money invested in new buildings is stretched over too large proportions.

The Minneapolis fire was, however, fraught with some valuable lessons. The Improvement Bulletin of that city has made a very careful diagnosis of it, and to that journal we are indebted for the following pertinent reflections:

"The terrible fire which wrecked three handsome buildings in Minneapolis last week has added a series of lessons to the mass of knowledge which is thus expensively being acquired in American cities, on the only economical manner of constructing buildings in congested districts. The situation was by no means unusual for city buildings. Three five-story brick buildings were destroyed. The larger one occupying the corner was about 90x100, and was joined on the east by a continuation of the building, separated by a fire wall, with thirty feet frontage. To the south and separated by a fifteen-foot private alley was the third building, of about forty-five feet frontage. In the latter building the fire started and was soon beyond control there. All the buildings were of 'slow-burning' construction. The alley mentioned was crossed by several covered bridge connections and it is believed that the fire doors, which should protect the openings, were not closed. As regards fire these buildings were distinctly safer than a number of others in the business district. The manner of communicating the flames from the original building to the corner structure is uncertain, but it has been charged to the short-circuiting of electric wires which fired the gases generated by the intense heat from the stock of furniture with which the building was loaded. The windows on the private alley were unprotected by either fire doors or wire glass.

"The foregoing is the condition of the buildings, which were all destroyed and their walls left crumbled and cracked so that later on one wall was blown over, crashing in an adjoining building, with serious loss of life. In addition, a department store building across the street from the corner building was also caught and a fire started, which was controlled by the firemen

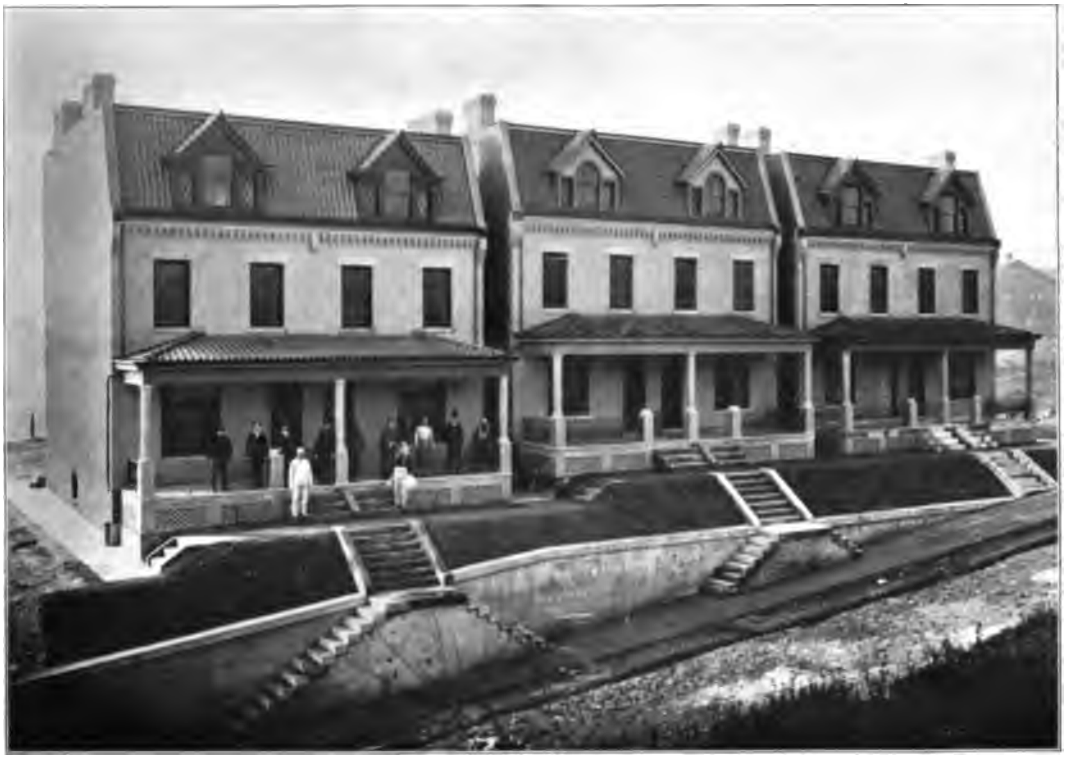
"One fact stands out prominently in the ruins and surroundings, and that is, to be fireproof a building must have materials which are genuinely proof against fire, and not merely slow-burning. The bank building adjoining one of the structures is a fireproof building, and it not only saved itself but also prevented the spread of the flames and stopped what might have become a repetition of the Baltimore fire."

Referring to the "department store building across the street," above alluded to, we are informed by our Minneapolis correspondent that while the fire in it may have been controlled by the firemen, the *prevention* of fire in it was probably due, in the first place, to its sprinkler equipment, which must have been of a very sensitive kind. He says: "There is, however, a sprinkler system used in the Powers building across the street, to which all the credit is given for saving this building from going up in flames and burning out the whole retail district of Minneapolis. The Powers building was slightly damaged on the corner and the flames across the street created such a heat that the sprinklers started inside of the building, and, of course, flooded the whole thing from top to bottom."

The thirtieth of December, 1904, was the first anniversary of the Iroquois Theater disaster, and was appropriately observed by the Iroquois Memorial Association at Chicago. The same building, restored, is now used for a "vaudeville show," and on the afternoon of the above mentioned day was closed on a telegraphic order from the lessees, dated Brooklyn, December 30, at 11:04 a. m. It was opened for the show in the evening, and the Chicago Tribune is authority for saying that the audience consisted of 327 persons, with a seating capacity of about 1,400. (See editorial, FIREPROOF MAGAZINE, October, 1904.)

Our cover design this month is by Prof. Newton A. Wells of the University of Illinois. The insert in the panel is from a photograph of the fireproof University Club at New York, designed by Charles F. McKim, architect.

THE BRICKBUILDER for December, 1904, makes a splendid offer to all architects of prizes, $500, $200 and $100, for the three best designs for fireproof residences in which hollow burned clay tiles are to be used, not only for the interior construction, but may also be used for the exterior, in order to develop the faculties of progressive architects in the use of machine-made hollow tiles for the artistic design of buildings. That this is possible has already been demonstrated in one of the buildings at Akron, Ohio, which has been illustrated in FIREPROOF MAGAZINE. This enterprise is in line with what has also been demonstrated in the leading article of this number, which describes houses already built, of moderate cost and unpretending design, and we cheerfully give publicity, unsolicited, to this scheme for a competition, the details of which may be found in the above-mentioned issue of the Brickbuilder.



FIREPROOF RESIDENCES OF MODERATE COST—THE HENRY HOUSES AT PITTSBURG

THE "long-felt want" is about to be fulfilled and Pittsburg will receive the first benefit of it. Time and again the question has been asked: "When are we to have fireproof dwellings?" This question does not refer to the residences of the wealthy. Attempts to fireproof such buildings, according to the methods in vogue at the time, have been made for forty years past. The Stewart mansion—so-called—at New York, was erected in 1866, in which iron beams and brick arches were used throughout and most of the interior finish was marble. It was probably as thoroughly incombustible a residence as has ever been erected, though not fireproof in the proper sense of the word, because no attempt was made to protect the constructive iron from the effects of fire. It was recently taken down.

During the last twenty-five years many other residences have been erected in New York, Boston, Philadelphia and Chicago, in which I-beams and hollow tile arches have been used for the floors and hollow tiles for the partitions and furring; in fact, during the last ten years the use of these materials has been generally common for all private dwellings in New York costing $100,000 or more. But little attempt has been made to introduce incombustible finish except where marble and bronze have been employed, and these have been used solely on account of their artistic effect. The houses of the wealthy are especially remarkable for the combustible nature of their contents. While few fires have occurred in them that have not been quickly extinguished, it is on record that two lamentable tragedies have already occurred in New York dwellings sup-

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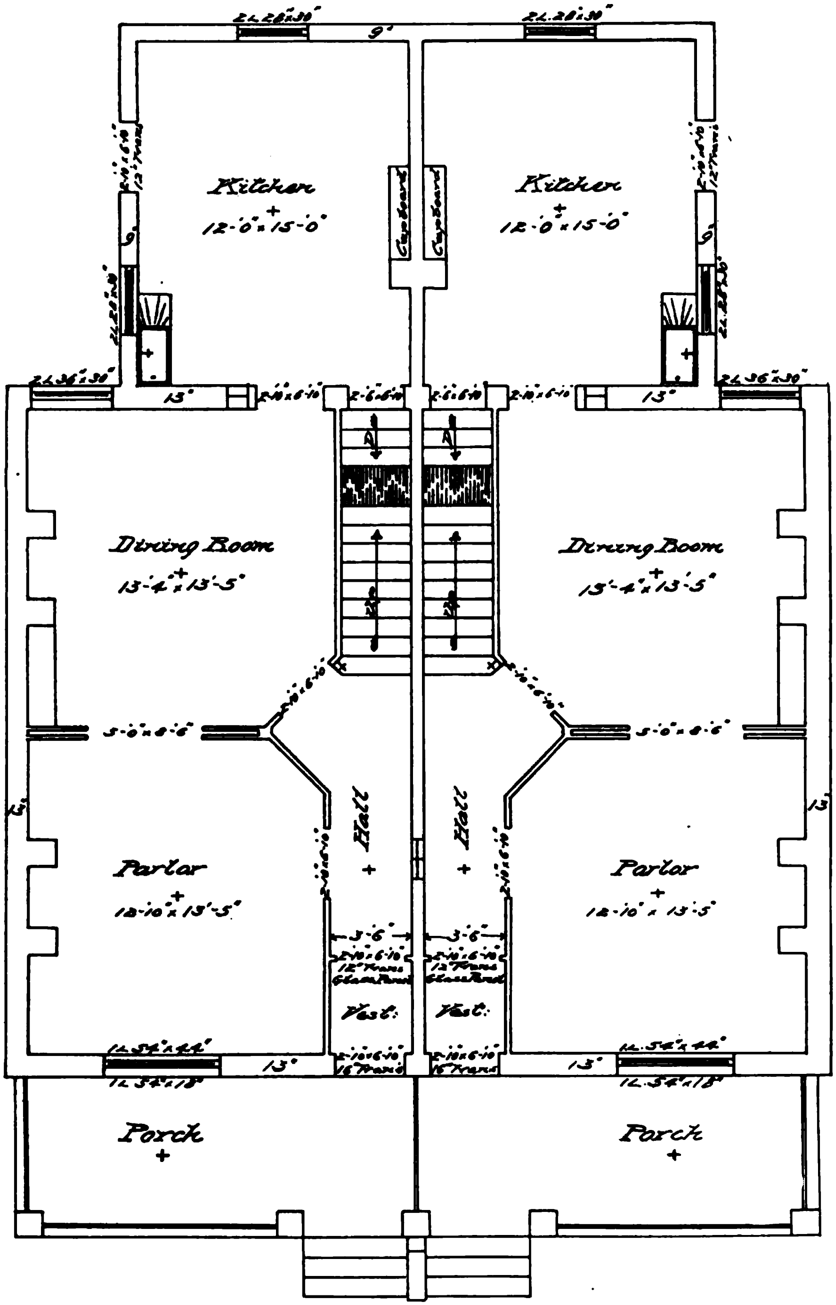
—for—
—Mr D F Henry—
—Darrah Street Pittsburgh Pa.—



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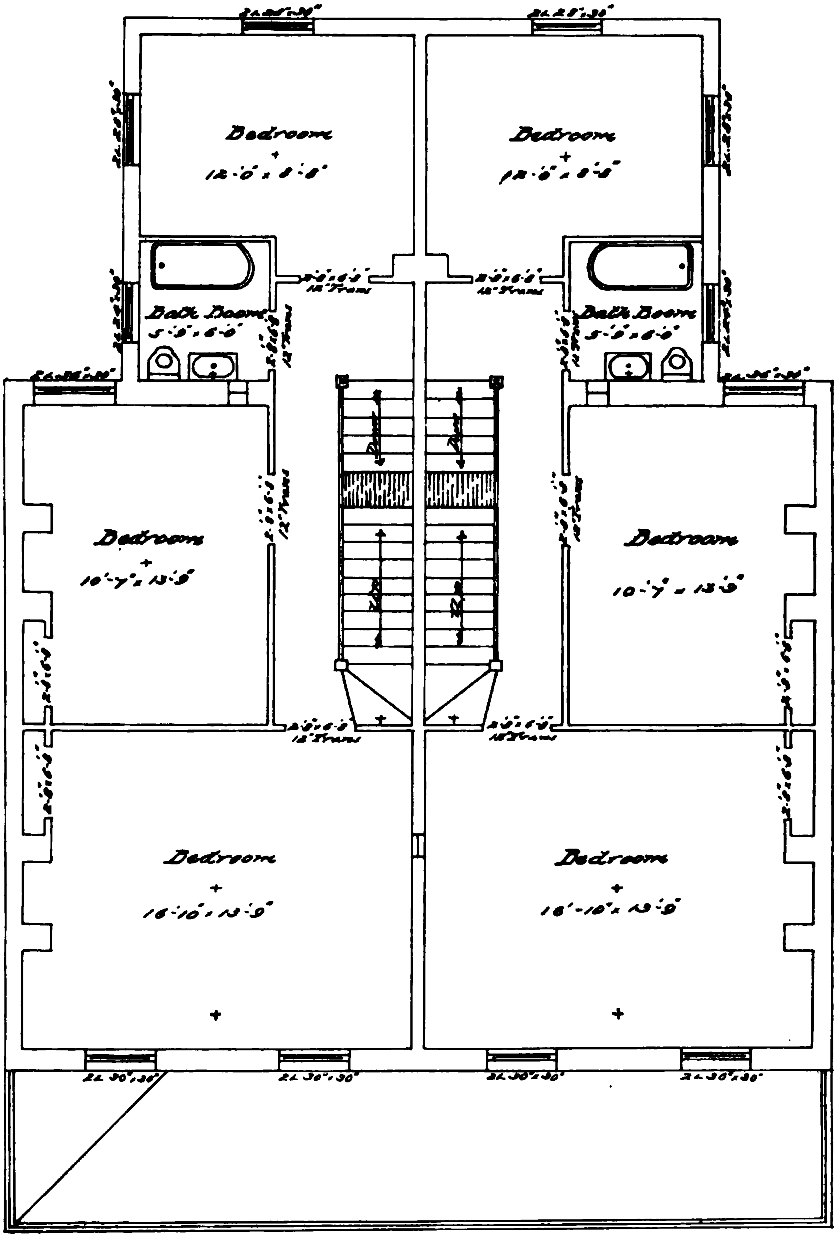

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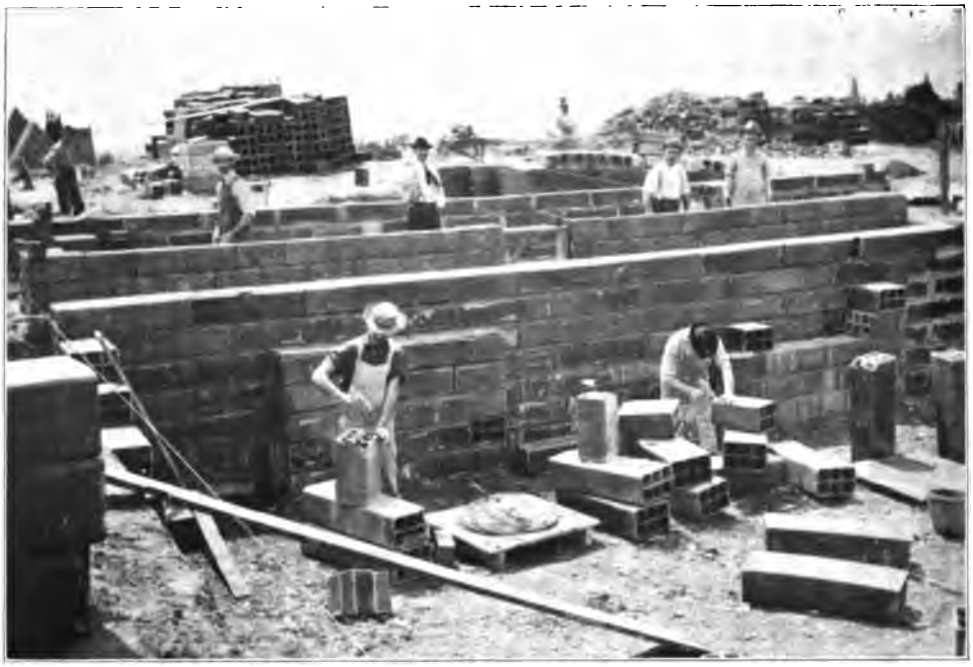
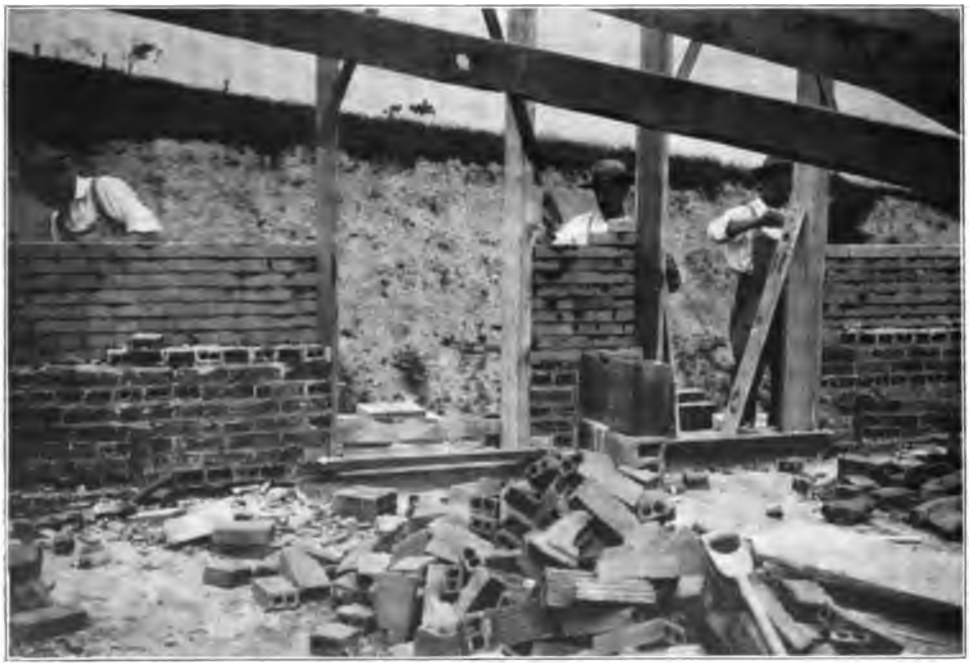
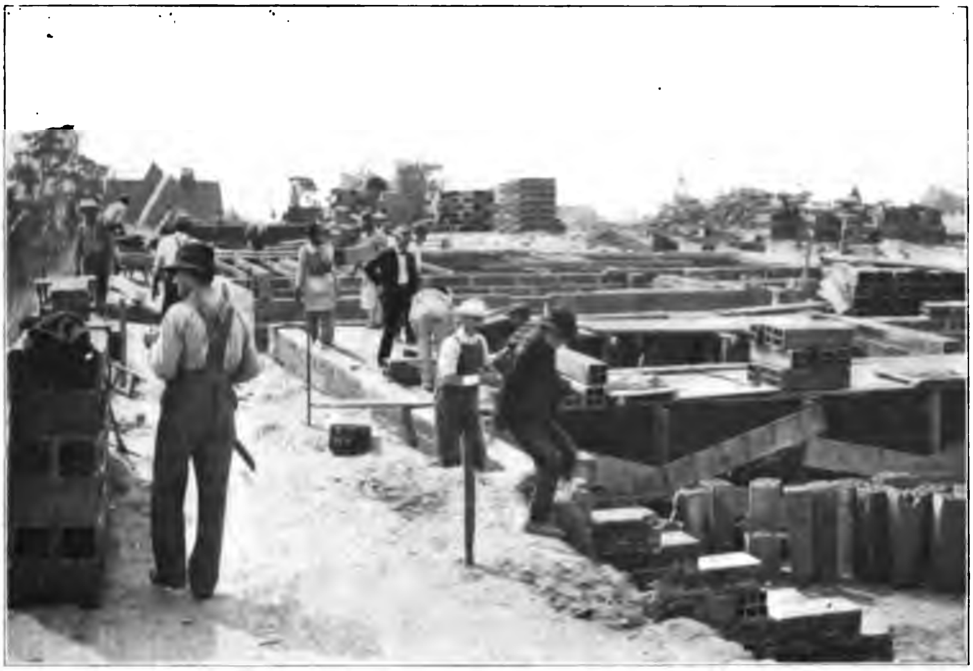


THE HENRY DWELLINGS, PITTSBURG.
Building Basement Partitions with Hollow Tiles.

posed to be fireproof, in which members of the families of the owners, and in one case the owner himself, met death of the most horrible description from fires of such rapidity and intensity as to prevent the possibility of safe exit.

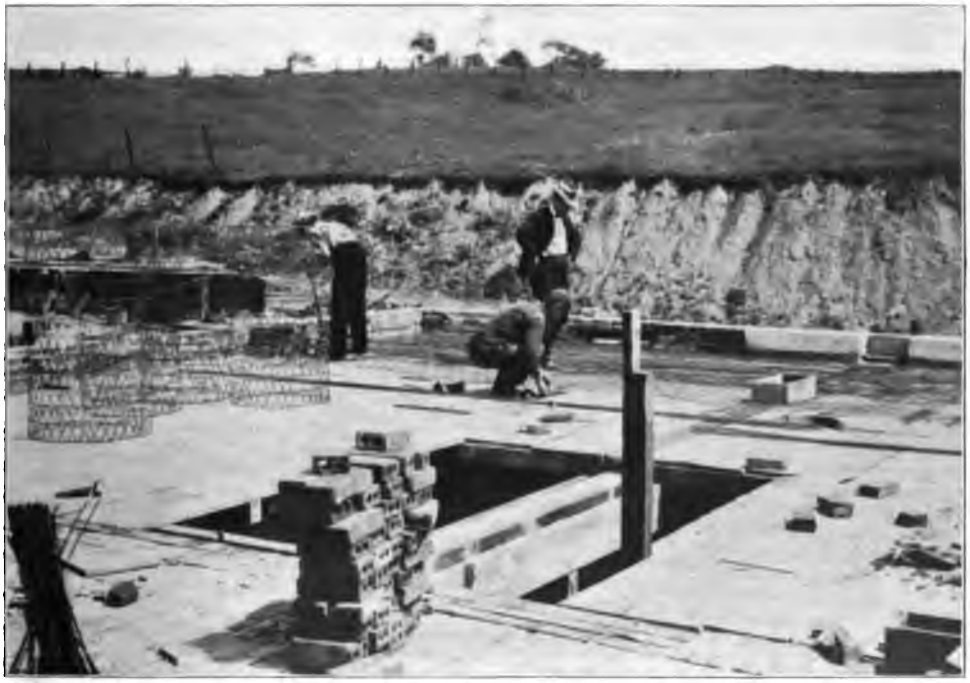


THE HENRY DWELLINGS, PITTSBURG.
Backing Pressed Brick Face Wall with Hollow Tiles.



THE HENRY DWELLINGS, PITTSBURG.
Building Basement Walls with Hollow Tiles.

While these disasters have had their lessons, from which a few possibly have profited, they have no bearing upon the matter now under consideration. The fireproofing of residences for the wealthy has heretofore been regarded as a luxury in



THE HENRY DWELLINGS, PITTSBURG.
Platform, Paper and Tension Fabric for Johnson System of Hollow Tile Floor.

which they were fortunately able to indulge. Architects have too often regarded it as only an essential for securing a substantial and enduring basis for carrying out elaborate schemes of finish and decoration, which often form the principal items of cost. These very details of inside work are often themselves a menace to the fire-resisting materials of construction and are frequently used to such an extent as to involve the complete construction of rooms of wood within rooms which otherwise would be fire resisting.

But all this is not within the possibilities of houses erected for the use of people in moderate circumstances. The very cost at once precludes it. And under any circumstances when the erection of fireproof houses of moderate cost has been demonstrated to be practicable and profitable it will always result that the man of wealth will be at a disadvantage as far as safety is concerned by reason of his luxurious surroundings, even though his house may be equally as fireproof in its construction as that of his neighbor who cannot afford to have much more than the necessities for a comfortable existence.

The important problem now to be solved, and that in which the results are most likely to be satisfactory, is the erection of houses of moderate cost that are really fireproof. This will, as we believe, soon be solved, if it has not been solved already. Our attention has been called to a practical demonstration recently made by Mr. D. F. Henry of Pittsburg.

Having a tract of land which has recently been made available for improvement on account of the rapid growth of that city, he determined some time ago to erect, as an investment, nothing but fireproof dwellings. He is following the example of H. B. Camp of Akron, Ohio, who has already built a dwelling and two apartment houses, using hollow tiles for every part of the construction, including the exterior walls. But Mr. Henry has been satisfied with good red pressed brick for the exterior, and Spanish tiles for the visible part of the roofs. These houses, be it known, are erected as a permanent investment, and in their design he has considered the importance of making them look like other houses that renters' eyes are accustomed to, so that no prejudice on their part could weigh in the least against any special novelty in the materials of the exterior. To be a success they must first of all meet the favor of tenants.

PUTTING IN THE LAST ROW OF TILES FOR FLOOR CONSTRUCTION.

Next, it was important to get the effect of the exterior rather from the good quality of the materials employed than any elaboration in design. Then the plan must not only provide every convenience for the families that are to occupy them, but be of such simplicity as not to involve any unnecessary complication in construction. The houses are built in pairs with party walls between them. They are what would be called in England "semi-detached houses." This reduces the cost of each individual residence without impairing its convenience. In the materials and construction the method adopted is that which is least expensive where light loads are to be carried. Hence, he used the Johnson system of floors, in which no kind of rolled steel is used. These floors have heretofore been extensively described and illustrated in this magazine. They are practically monolithic, being composed of hollow tiles laid in straight courses over all the spaces, filled between the courses with one inch of concrete, and another inch of the same under them, in which steel fabric used for tension is embedded. While the outer walls are all faced with brick they are backed with hollow tiles, so that no other furring is required to keep out dampness. All the interior walls and partitions are also of hollow burned clay tiles.

The basement walls are built entirely of hollow tiles, 9x13 inches, No. 2 multiple conduit pipes three feet long being used. These make a good dry 13-inch wall. The porch floors are constructed the same as the room floors and finished with "granolithic." No tin is used, gutters and spouts are copper and the piazza cornice is galvanized iron. The minimum amount of wood is used for the inside finish. The laundries are in the basements and instantaneous water heaters are used.

The cost of these houses was $4,600 each, which it was found after taking bids was only $500 more than if ordinary construction had been used. This bears the previous estimates in this magazine showing that for plain buildings the excess of cost for fireproofing is little more than 10 per cent. Still, with this additional cost it has been found that they will rent for $45 per month, with which the owner is satisfied, as a fair income on the value of the buildings and land. Therefore, these houses can no longer be considered as an experiment from the financial point of view. If they are not works of art they are at least comfortable and very respectable residences, in which the occupants need not have the trouble of carrying anything more than moderate policies of insurance, while the owner has declared his intention of *carrying no insurance at all.* There will also be a minimum cost of repairs on such structures, due to their substantial construction.

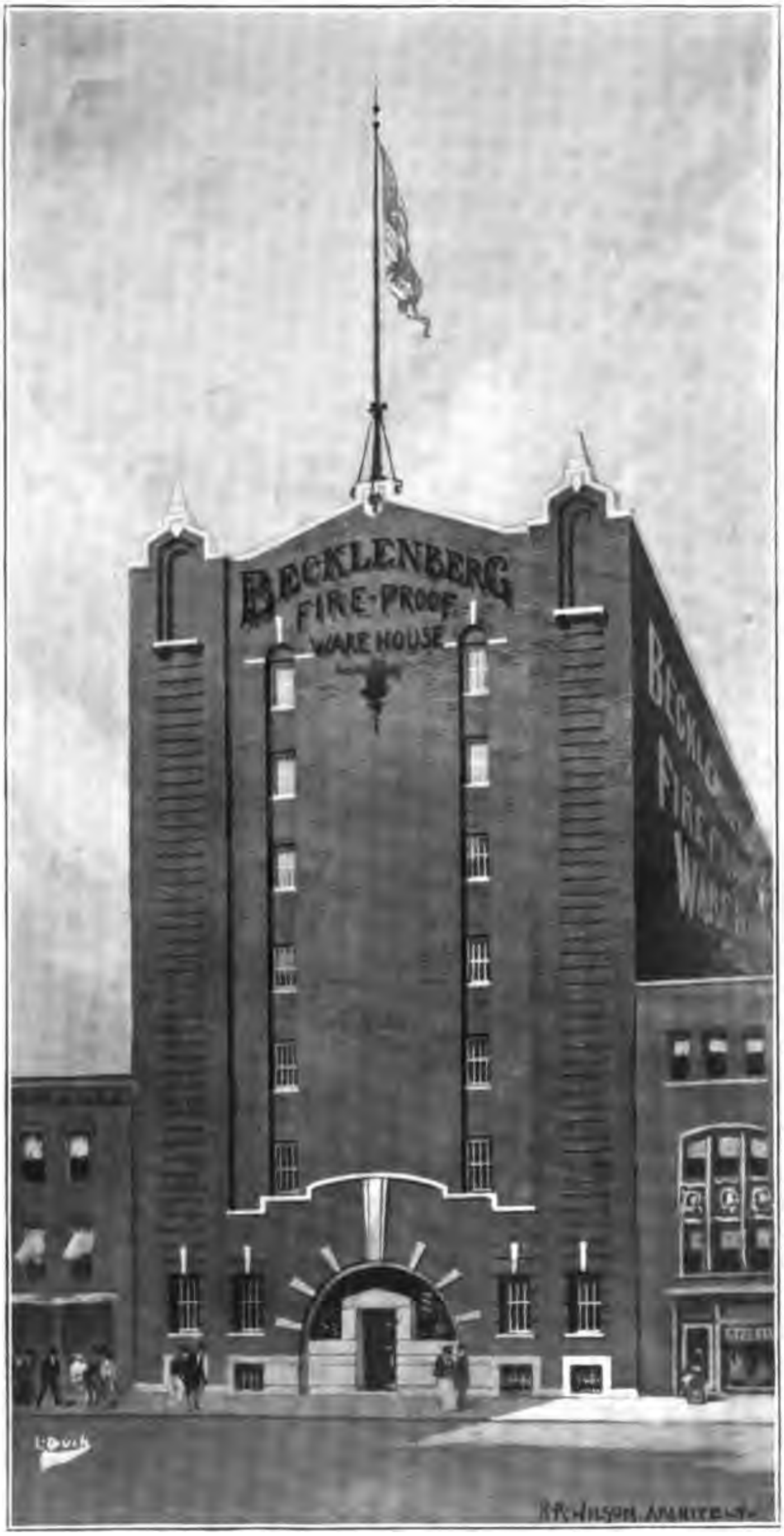
The owner is so well satisfied with them that he has announced his intention to erect twelve more on adjoining property.

The illustrations which we present show not only the front of the buildings as completed, but the operations while they were in course of construction.

SONNET

Vex not the royal saint with vain expense,
With ill-matched aims the architect who planned—
Albeit laboring for a scanty band
Of white-robed scholars only—this immense
And glorious work of fine intelligence!
Give all that canst; high heaven rejects the lore
Of nicely calculated less or more;
So deemed the man who fashioned for the sense
These lofty pillars, spread this branching roof,
Self-poised, and scooped into ten thousand cells,
Where light and shade repose, where music dwells
Lingering, and wandering as loath to die:
Like thoughts whose very sweetness yieldeth proof
That they were born for immortality.
What awful perspective! while from our sight
With gradual stealth the lateral windows hide
Their portraitures, their stonework glimmers, dyed
In the soft checkerings of sleepy light,
Martyr or king, or sainted Eremite,
Whoe'er ye be, that thus, yourselves unseen,
Imbue your prison bars with solemn sheen,
Shine on, until ye fade with coming night!
But, from the arms of silence—list! O list!—
The music bursteth into second life;
The notes luxuriate, every stone is kissed
By sound, or ghost of sound, in mazy strife;
Heart-thrilling strains, that cast, before the eye
Of the devout a veil of ecstacy!
They dreamt not of a perishable home
Who thus could build.

Wordsworth.



THE NEW FIREPROOF BECKLENBERG WAREHOUSE
Sixty-third Street and Lexington Avenue, Chicago
H. R. Wilson, Architect

THE DEMAND FOR STORAGE WAREHOUSES

FIREPROOFED WITH STEEL AND TILE—A CHICAGO CASE

IF there were any question of the great demand and popular regard for fireproofing and popular interest in fireproof subjects, Chicago enterprise supplies the direct evidence. One of the city's best known and most progressive storage warehousemen recently, within less than a year, completed a fireproof storehouse, as much, he says, as a comparative experiment as anything else—with the result that very available inch of space was snapped up almost immediately the construction was announced, and long before completion.

Nor this alone: The demand for fireproof storage in Chicago's South Side residence district is so great that rates in this case came almost to the point of competitive bids for space, which inevitably produced an advance in the scale of prices, greatly to the financial advantage of the owner, not to mention what really amounts to a waiting list for vacancies as they occur in future.

The Becklenberg Company had planned to add another fireproof warehouse to its holdings three years hence, but in view of the phenomenal success of the first venture decided to build at once.

An interesting feature of the case is that through the columns of this magazine the interest, financial and conservative, of bankers was drawn to the security value of such property, and the banks began advertising for *fireproof security for building loans.* This brought the storage company to the bank with detailed drawings, fireproofing specifications, etc., and the naked value of the land as its only collateral.

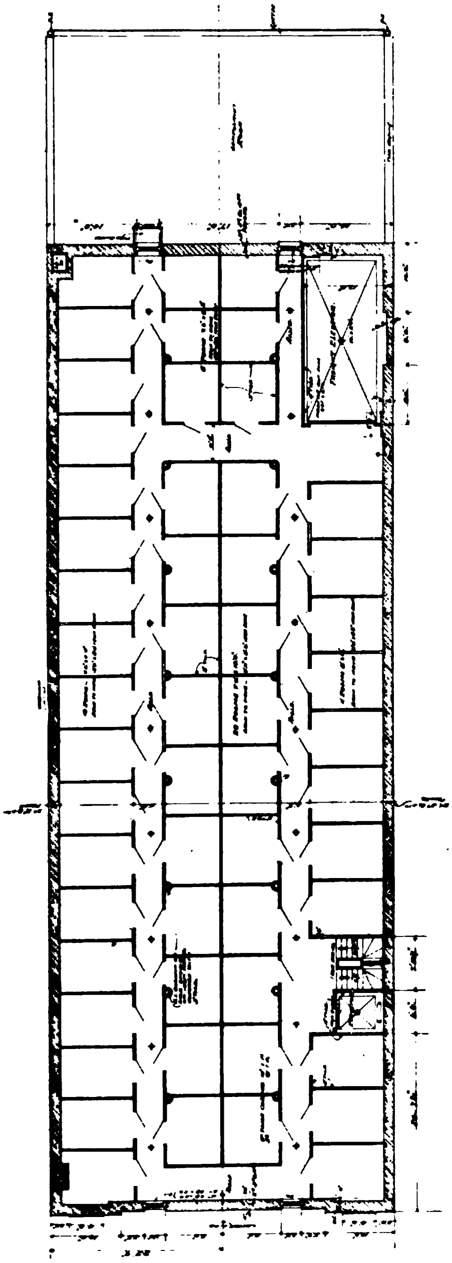
The bank loaned ten times the value of the lot; in short, the loan of $70,000 for five years was practically concluded upon the basis of the new *building* and its earning power as constituting 90 per cent of the security. To builders of storage property these facts will come as conclusive of the advantage, and we might say the *business necessity* of building *fireproof.*

It is a forceful concrete example of the fact that live storage warehousemen and bankers understand the compelling arguments advanced for higher types of fire-resisting buildings for this and similar purposes.

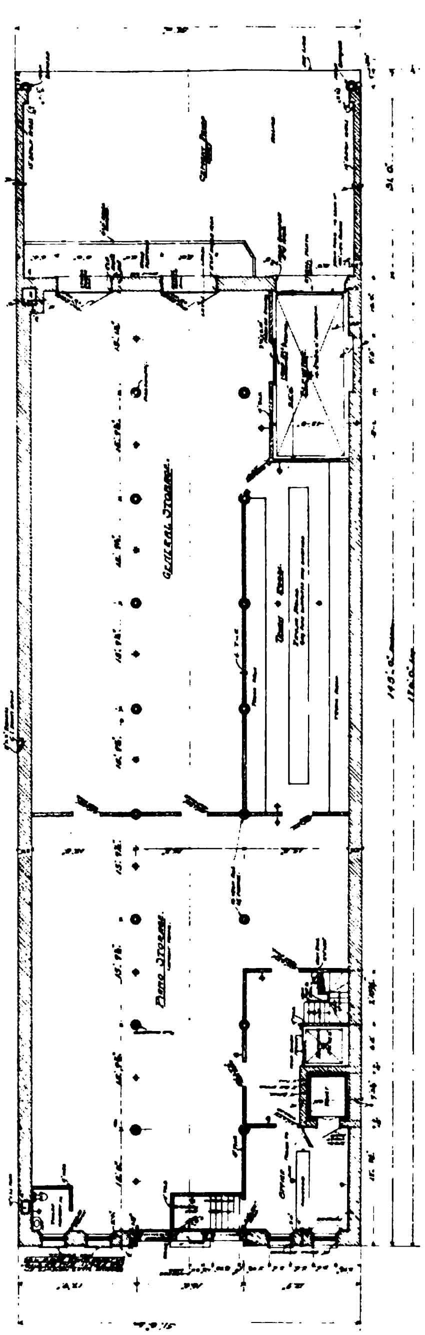
A singular result of this case in Chicago is the action of other storage men in opening immediate negotiations with architects and bankers looking to the erection of similar properties similarly built, *in order* to *protect their business* and *prevent* a general withdrawal of custom to other and safer quarters.

Cut rates for storage is the first net result of the new demand, with all the advantage on the side of the fireproof buildings and the imminent danger of desertion of those of ordinary wood construction, no matter how well equipped with iron shutters, cut-offs or sprinklers.

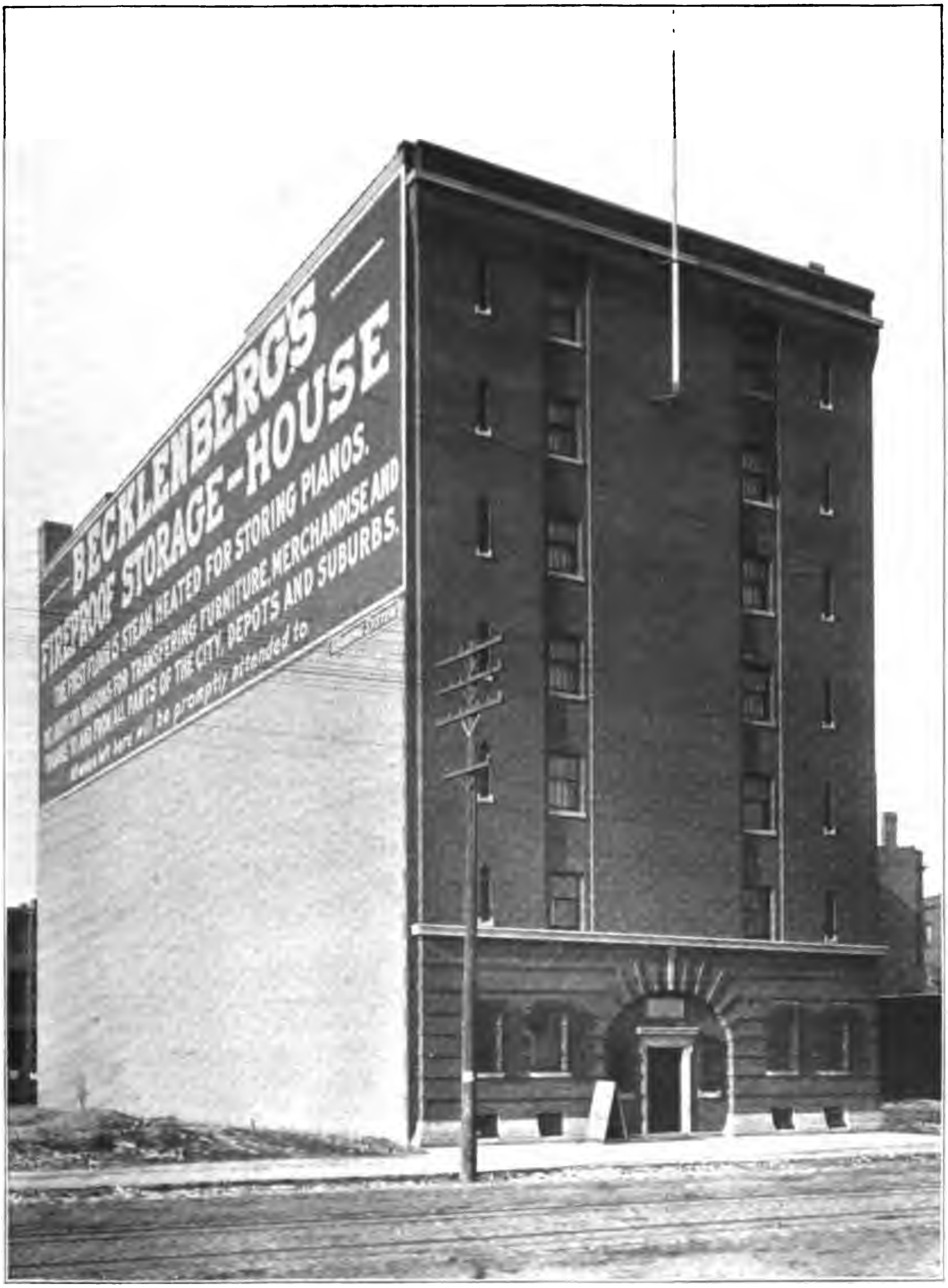
Bankers are arguing that the profits arising from the fireproof constructions enable reductions of the loans to be made at so rapid a rate that these properties become especially attractive security from the real estate loan standpoint, and inspire



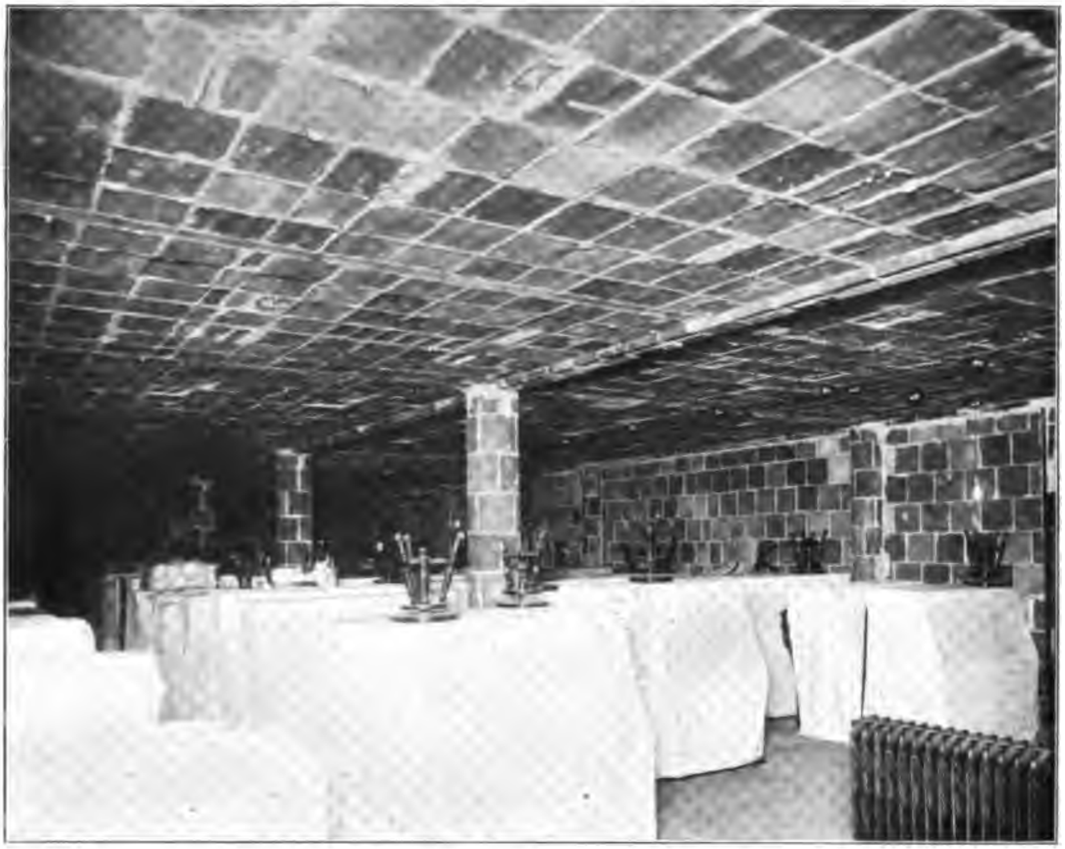
Second and Third Floor Plans



Ground Floor Plan
THE NEW BECKLENBERG FIREPROOF WAREHOUSE, CHICAGO
H. R. Wilson, Architect


BECKLENBERG'S
FIREPROOF STORAGE-HOUSE
THE FIRST FLOOR IS STEAM HEATED FOR STORING PIANOS.
WAGONS FOR TRANSFERRING FURNITURE, MERCHANDISE AND
PIANOS TO AND FROM ALL PARTS OF THE CITY, DEPOTS AND SUBURBS.
will be promptly attended to

THE BECKLENBERG FIREPROOF WAREHOUSE ON COTTAGE GROVE AVENUE, CHICAGO
H. R. Wilson, Architect



THE BECKLENBERG WAREHOUSE, COTTAGE GROVE AVENUE, CHICAGO
View in First Story, Showing Heated Storage Room for Pianos

confidence not only in the investments themselves but in the officials financing discounts upon such favorable securities and upon terms so advantageous.

Mr. H. R. Wilson, architect of the Becklenberg properties, is outspoken in the good things he has to say of FIREPROOF MAGAZINE in its work of giving publicity to the facts and figures of progressive and safe building construction, the success of the negotiations in this case being directly attributable to the articles published in these columns from time to time upon this popular-technical subject and its bearing upon the home as well as upon professional and building subjects.

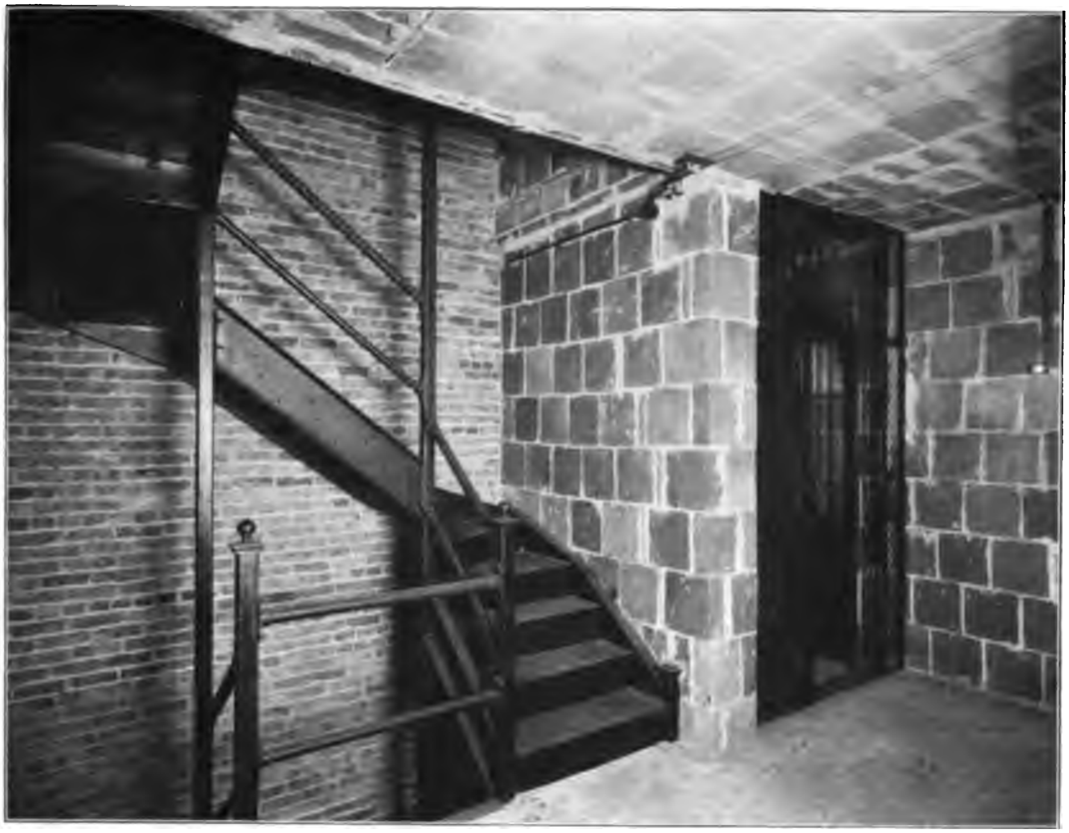
"Structurally considered," said Mr. Wilson, "the New Becklenberg Warehouse is of the best approved steel skeleton construction, seven stories in height; floors of arch construction built of ten-inch hollow tile.

"The front is unique, as may be observed from the reproduced drawing accompanying, being in design a special composition architecturally an expression of the utility of the building itself.

"The front is built of stone and vitrified brick. Within are 550 fireproof compartments enclosed with fireproof tile partitions, the openings closed with doors of steel.

"Included in the enumeration are trunk vaults, piano rooms heated, and a specially constructed elevator of sufficient capacity to carry a full vanload from the street entrance to the top floor without unloading.

"Most of the compartments are individual private rooms—only the basement being reserved for open storage.



THE BECKLENBERG WAREHOUSE, COTTAGE GROVE AVENUE, CHICAGO
Stairway Arrangement

"The offices of the warehouse have mosaic floors, marble top desks and all furniture of every description is metallic; there is nothing whatever within the walls of a combustible nature except the storage itself in the separate enclosures.

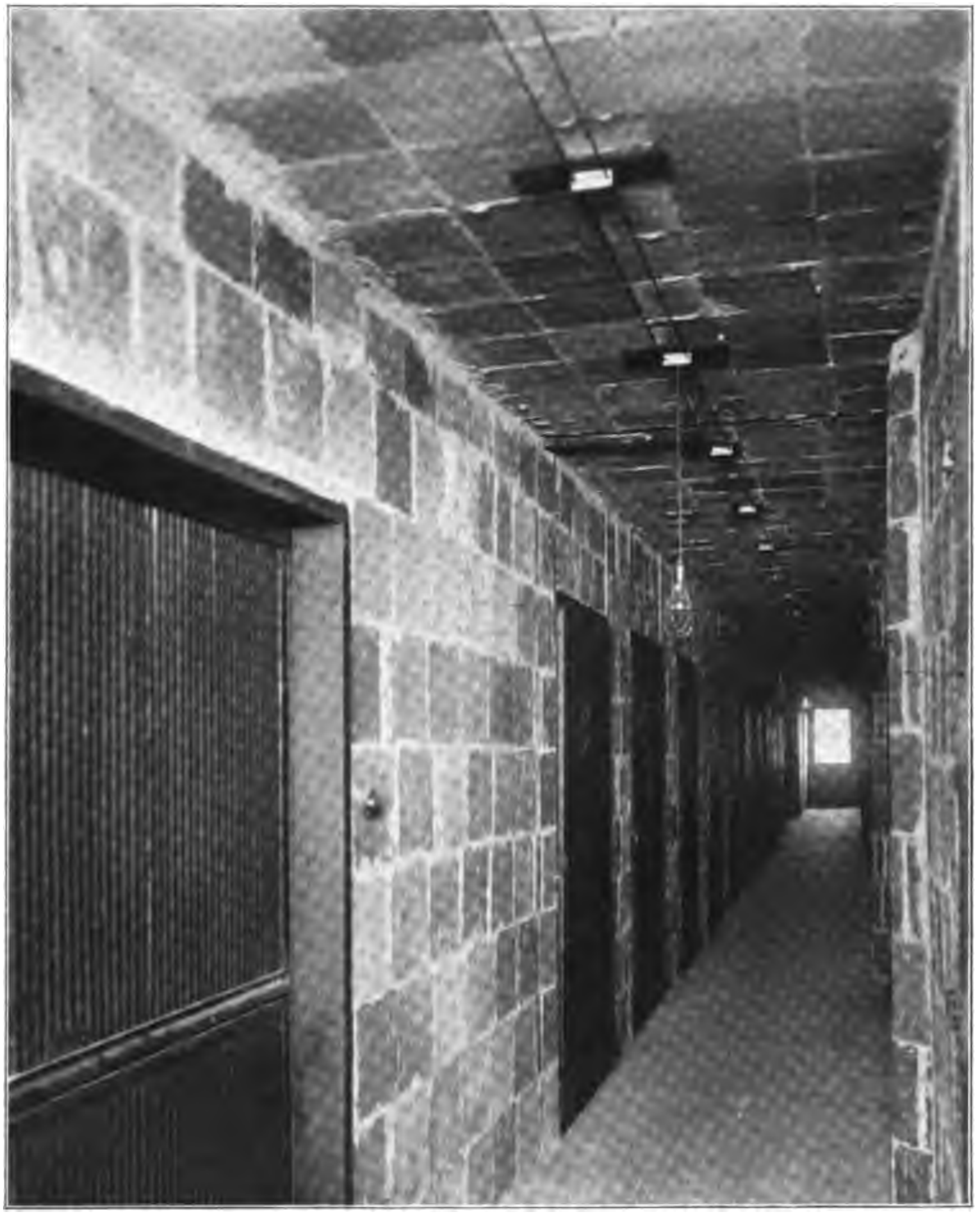
"First floor windows are all guarded by heavy iron grills.

"The insurance rate is specially gratifying to the owner, being less than ¼ that upon the mill constructed warehouses owned by the same company.

"The drawings shown give typical floor plans of the Becklenberg building, the total cost of the construction completed being $130,000."

The building above referred to is now being erected on Sixty-third street near Lexington avenue, Chicago, and will be completed on the first of April next. The illustrations we give are copies of the first floor plan and those of the upper floors which resemble each other; also a perspective view of the front, copied from Mr. Wilson's design.

The other building belonging to the same company, referred to in the first paragraph of this article, is located on Cottage Grove avenue near Forty-seventh street, Chicago, and was also designed by Mr. Wilson. We present pictures from photographs of the exterior and interior. The latter show very nearly what the construction and finish of the new building will be. It will be noticed that the interior is not plastered, the semi-porous hollow tiles all being visible. The floors are finished with cement similar to modern sidewalk work, and the first story of this (as well as will be the case with the new warehouse) is heated and reserved for the storage of pianos and other musical instruments.



THE BECKLENBERG WAREHOUSE, COTTAGE GROVE AVENUE, CHICAGO
Corridor on Second Floor, Showing Doors to Elevator and Private Rooms

FIREPROOFING VERSUS FIRE INSURANCE

BY W. T. RITCHIE, CINCINNATI.

AT no time in the history of the English-speaking people has so much thought been given to the subject of insurance and its various ramifications in all departments of business as that which marks the present period; and the end is not yet. The very best efforts of the best minds in the country have been directed in this direction of investigation, ever seeking a remedy for the existing evils. And those in contemporary life who are interested in the subject matter have seen the fruits of some of these efforts in certain well-known directions, notoriously bad, that had heretofore been the bane of the insurance world, and, in fact, "passed" in all well-appointed and carefully-conducted underwriting establishments. The results in these particular instances have been amazing, and nothing more has been required than some thought in the first instance, some little time and the expenditure of some money. As to the latter, it is easily susceptible of proof that the saving alone in the outlay of insurance or premium, if put out at interest, would create a fund larger than the combined capital value of all of the plants, including their equipment, and as to the losses, taking into consideration only a period as short as the last eight or nine years, it is as easily demonstrated that the per cent is less than four cents a hundred dollars of insurance carried, as against at least sixty cents with those who won't think, can't take the time and are unwilling, for one reason and another, to spend what experience has shown is but a reasonable sum of money, comparatively. The foregoing is the experience in the scientific treatment of textile factories, paper mills, machine shops, and many other enterprises of a like character. Every one of these interests has found that it has paid to undertake fireproof construction, and their experience in this direction, or the results rather, are to some extent shown.

Perhaps there never has been an interest so thoroughly in a class of its own, so marked for an early and untimely death in carefully conducted underwriting circles, as that of the rubber manufacturers. Common honesty compels a confession that up to the year 1884 all such enterprises had a bad name, even among themselves. (This is, by the way, a most unusual confession or admission, for all experts and all persons of experience universally find the complaint to be that it is the other fellow's plant that is all wrong, and that the particular risk, the subject of inquiry, is unjustly treated and discriminated against.) The losses in this particular industry had been very heavy, the rates of insurance were excessive, and even at that the insurance procured, as is always the case, when one "hunts" for it in the highways and by-ways, was of the most questionable character. Any old thing will do until there is a loss, which latter in a most convincing manner demonstrates the difference between a "diploma" and a "policy of insurance," and the assured finds to his cost that things equal to the same thing (so far as the surface indications show) are not equal to each other. He is left without a hope and can at best but imagine a vain thing. In fact, some of these so-called insurance companies were so weak financially as to find it advisable to fail to return any "return premium" upon "cancellation," quite a common fault with that fraternity. But there is no "error" but what will lay the foundation for a "review," and there is no fault but what has its remedy. There was a getting together of those prominent in the rubber interests, there was some thought, reason was again enthroned, a common-sense view of things was taken, and the "hazards" of the businesss were carefully considered, studied and admitted. Fireproof construction was adopted and other conditions were brought about entirely within the control of the assured. So marked was the success in this direction that this once black sheep of the fold was taken back and "concurrent" insurance was obtainable from "stock" companies, at a very much less rate of premium. And the losses have been at the rate of about four cents per one hundred dollars on the average, year by year, thus clearly justifying the judgment of the "underwriters" before and after that getting together of these complainants of 1884, and just as clearly showing the wisdom of a common-sense fireproof construction, with attendant precaution thereafter proportionate to the hazard.

What has been done once can be done again. This question of insurance has got to be treated sensibly. The experiences of several outlawed interests have been fully shown on this proposition of fireproof construction and insurance; the results will be the same again with others adopting the same course. It is a condition and not a persecution that confronts the business world in its relation to insurance circles. It is not at all responsive to the situation to malign writers of insurance. An underwriter is not one to be abused; he is patient and long suffering, kind and at times improvidently generous in the settlement of worthy losses, but there are limitations upon the ordinary powers of endurance. The underwriter knows his business and he has been too often judged in the light of subsequent events to have his opinion very seriously questioned. Hardly a day passes but what this is shown, particularly in the larger centers of population. Perhaps the most marked is that of a neighboring state, and it is only mentioned specifically, owing to aggravating circumstances accompanying it. The incidents in question covered a period of four days and called into active operation practically every piece of fire-fighting apparatus in one of the largest municipalities in the country. Its chief thus designates it: "As far as I can remember, this fire record is unprecedented." In each case the property was totally destroyed, involving a money loss of about $400,000 in all. This will fall entirely upon the assured, as the amount carried in the way of insurance is too light, being, upon the whole, rather insignificant. The physical condition of the risk, in each instance, barred them from favorable consideration upon the part of underwriters. Not one of these risks but could and would have been covered under proper conditions, for those engaged in the several enterprises were men of character, and the business was successfully conducted in each instance. And so it could be multiplied without end, but there is no need of multiplying instances justifying the action of underwriters. Not a plant is constructed in any part of the country that is the subject of an insurance contract, the condition of which and the hazard affecting it are not fully known to writers of that insurance contract. If there is any expectation of escaping a questionable construction, in either plan or material, it may as well be given up, for even if a questionable construction was allowed to pass the "firing line," as the result of local causes or gain, it would certainly be headed off at "headquarters," which figures on leaving nothing to chance. On this proposition fireproof construction and insurance are moving along identically the same lines.

What has been done for certain outlawed

industries, as herein shown, can be done again in individual cases. This question of insurance is to be treated sensibly, and in the long run it is going to be a matter with the individual along the lines of fireproof construction, in some form. The state and its agents, the municipalities, all over the country, in one way and another, have attempted the creation of a guardianship relation in matters of insurance with some success, and it is undertaking the like in matters of building construction, with results more or less ridiculous. It is a beautiful thing to contemplate law as a rule of civil conduct, the perfection of human wisdom, but to him who has bumped up against it, been in and out of it and part and parcel of it, in things practical, this ideal suffers something of a fracture. It is beautiful also to contemplate the supine confidence of the people in this remedying a wrong by the enactment of a law. This is good as far as it goes, but it is not all, and unless there is something more, this lawmaking is but the going through of so much motion. A law is effective just in proportion as there is a willingness and the ability to enforce it. Our statute books are full of remedial laws, placed there as the result of some upheaval, only to be forgotten. The selection of public servants which precedes a ratification designated an "election" is notoriously in the hands of a few, a combination peculiarly susceptible to influences of self-interest. Politics used to be a trade, but it is now a business. The lessons of the year now slipping away to be for all time numbered with the past, which is dead, are already forgotten. Playhouses of all grades are open all over the country upon practically the old conditions. There was at first the usual uprising of the people, promising much in good results, and that is about all. A question of expense, some influence in the proper direction, the forgetfulness of the public due to the strenuous life of this latter day, have combined to the undoing, and the past is forgotten, except by those who have paid the losses. The state neither by itself nor by its agents, the municipalities, will ever bring about a practical solution of the present condition of questionable construction impartially all along the line.

But every fault has its remedy. The insurance world, which has ever been fair in its treatment of the public and those who understand the situation as it is, do not forget. The money paid out for losses in the year 1904 has far exceeded that of 1903, which were enormous. This condition of affairs cannot be kept up indefinitely; insurance must be carried on at a profit or it will not be written. The causes of nearly all these losses are traceable to conditions entirely within the control of the assured, particularly in the construction of fireproof buildings. The rate of insurance has been found inadequate to make the business profitable, and it has been increased under certain conditions, and this increase will continue until it is made profitable and worth one's while to remain in it. The result of this action in the direction of "rates" has been the enforced attention to the physical hazard upon the part of the assured, and he sees himself now as others see him. It is now a matter entirely personal with the assured. He can do just as he pleases. He can improve his condition, or he can leave it alone; if he does not improve it he will be compelled to pay an increased rate or "to carry his own insurance." If he will consider the matter properly, free from the bias prompted by self-interest, he will find the advance in rates not to be arbitrary, but based upon existing conditions, and not only is this so, but the underwriters have gone so far as to point out the faults and show the remedy as to existing plants, and this is as far as they can go. The only real remedy as to the assured will be in the proper construction of fireproof buildings, buildings within themselves that are further able to confine a disturbance within confined areas. He must do of his own motion what the state has failed to do. The pressure emanates from a quarter that should have been the last to have undertaken it, and it never would have been undertaken were the conditions proper and in keeping with modern development. His failures in the proper construction of fireproof buildings and construction generally are visiting the consequences upon the assured alone. Fire losses now are falling more and more upon the assured, where they belong. He that will not hear must feel.

The result is going to be beneficial. The assured, under this pressure, prompted by motives of self-interest, of his own motion is going to adopt in some form fireproof construction. When he does there will be no further complaints and only normal fire losses, due to causes beyond his control, and these confined to their proper "areas."

SOME NOTES ON THE QUESTION OF FIREPROOF CONSTRUCTION

(From the Canadian Architect and Builder.)

The statement has been made in a paper read before an English insurance society that the recent losses to English companies by conflagrations in this country have exactly wiped out the profit to their shareholders during the last fifty years—and the vipers are going to raise the rate on us. This seems to mark a crisis. It is a hint that we are not quite within the pale of civilization. It appears that the people of the United States are in it, too, but that should be no encouragement, for they are quick movers over there, and before we know it we shall be alone, marked down for burning, by people with whom probabilities are a science a trifle too exact to make it a comfortable matter to be on the list of suspects. It is time to change our ways. The question is how to change them effectively. There is no use in talking fireproof construction; we have done that. There is no use in blaming the architects; they know all that is known about fireproof construction and would be glad to practice it. It is the architects' clients who condition the state of building, and they are the people we have to deal with. The truth about the halting progress of fireproof construction in this country is that the business public do not want fireproof buildings. They would like their buildings to be fireproof well enough, especially after a big fire; but the wish dies a painful though not a very lingering death under the influence of preliminary estimates for rebuilding with fireproof construction. A conflagration is but a chance after all and the cost of fireproofing is a certainty, and it is not business to balance a certainty of cost against a problematical advantage. There is some return in the reduced cost of carrying insurance, but it is not enough to even up the transaction, and there is practically "nothing doing" in fireproof building.

Then comes the cry for stiffer by-laws. Let us force them to build fireproof; the extra cost is not a matter of choice, it is a public matter. Very well; let the public establish preferential trade with the owners of fireproof buildings in proportion as their buildings are fireproof and their prices therefore high. This is a perfectly fair proposition, but in view of the fluidity of cash, which flows steadily to the lowest levels, it amounts to a proposition to make water run up hill. How then is the suggestion to be carried out? It is still true that if the public have a right to say they have a right to pay. How can the public, who share in the advantage of an individual fireproof building, share in its extra cost? It is at any rate not to be brought about by sending the assessment commissioner after him to rate him for extra taxes for the public benefit on the score of his extra expenditure in building so as to benefit the public. This would not be a good thing to do, but it seems to suggest what would. If a man taxes himself for the benefit of the public it would not be fair (to him) to tax him again on the amount of his own taxation, but it would be quite fair (to other people) to remit taxes to him on the basis of that amount; and, inasmuch as taxes should be fluid also and level up all hollows in the public estate, the displaced tax should find its settlement on buildings that are below proof in the matter of fireproofing. It is for them and because of them that the firehalls are maintained, and they should pay for their maintenance. Here then is, if not a complete proposition, a suggestion of a direction in which to feel for a string which will make fireproof construction sit up. It would be interesting to figure out the relation between the extra cost of a fireproof great-risk district and the cost of the firehalls which supply it to see how far one can be set against the other.

A CHAT

ANENT THINGS PERTINENT, WISE AND OTHERWISE

BY F. W. FITZPATRICK.

FOR some reason or other cement manufacturers, concrete makers, and engineers who have gone concrete-crazy, have lately been flooding me with all sorts of journals and cement lore, thinking, possibly, that I need illumination on the subject. Some of those papers are interesting while others are calculated to make one exceedingly weary in their over-weening desire to exploit cement. Cement is the only thing to build with, every detail of a building should be of cement, furniture and fittings should be of cement, and I really believe that some of these "béton-arméniacs" would advise an expectant people to eat concrete pies and wear concrete clothing. Nearly every journal vociferously exploits some special system of concrete floor construction; all else is wrong, and that alone has stood all the tests. The specialists and writers dig into the past for their precedents and glibly descant on the great concrete work accomplished under Augustus and Titus, in Rome, and proudly point to the Pantheon dome as an example of monolithic concrete construction that has withstood the ravages of time, etc., all set to beautiful phraseology and bound in very *edition de luxe verbiage*. They forget or do not know that that very dome depends for its stability upon brick ribs, and that the concrete was used simply to fill in the sunken panels between those ribs that carry all the weight. The best class of Roman work—than whom there were no better masonry builders in their time—almost invariably had the concrete in great masses and used for filling in or backing walls that were faced externally and internally with brick, marbles, etc. Concrete in masses, used for foundations, used for filling in, used under compression and in an hundred and one other places, is still the best thing that we have, perfectly legitimate and in receipt of every unbiassed engineer's commendation. Once again, I repeat, it is the use of concrete in slabs, in alleged monolithic floor construction, in tension that is objected to, and it is against that form of construction that I humbly raise my voice, and therein am I but respectfully following in the footsteps of Vitruvius, the greatest of Roman constructors, who prayerfully protested to his emperor, Augustus, against the use of monolithic concrete in floors, in bridges and arches, because, forsooth, the accidents and deaths among the slaves engaged in this work were really appalling. Collapses and failures of concrete work occurred then, as now, yet the lives of slaves were not counted as very much in those days, and it was for that reason, and in fact, only for that reason, that concrete in such forms flourished in that period. They could take chances with a few hundred workmen and it was only after Vitruvius' protest that humanity was stirred to some compunction and the great works were carried on in brick with the concrete as the secondary medium of construction. My protest against concrete floors is based on the same humanitarian grounds. No man has the right to jeopardize another's life and property to satisfy his own cravings for experimentation in questionable and dangerous construction.

This policy pursued by the cement interests is mighty shortsighted. There are so many ways where cement may be used legitimately that really the comparatively small quantity that can possibly be used in the thin monolithic slab-floor construction is hardly worth considering from a commercial point of view, and surely is not important enough for them to jeopardize the reputation of cement in its legitimate fields, for, mark you, the public is perhaps a little fickle , but yet a terribly earnest and inexorable arbiter of what it will have and what it will not have. Just now, it has let itself be beguiled into and has accepted quite a little concrete flooring. Let there be a few more failures, and let time and fire demonstrate the worthlessness of most of such work and the people will damn not only that, but everything that is cement. Reaction is apt to go to excess.

* * *

In one of those papers I happened to notice some editorial comment anent some phase of the president's policy. I forget now what it was, but it was worded quite flippantly and I remember it referred in several places to "Teddy." Now then, that is rather bad form. Not particularly because it was in one of the journals that I love so little, but it simply recalls to my mind the deplorable habit into which we have gotten of showing scant respect to authority. That feeling permeates the whole tissue of our modern society, and I think that most of it comes about through the example of the public press, and particularly the cartoonists from whose shafts no one is exempt. I am no stickler for "lèse majesé" laws and all that sort of thing, but do believe that we should be far better off if some slight respect for authority were inculcated into our children. The rising youth has absolutely no respect for any authority, parental, governmental, school or anything else, and we are bringing up a generation of scoffers at authority, anarchists at heart—flippant cynics. Why, a little while ago I happened into a school; one of the boys was told to draw something on the blackboard, and with much gusto he painfully scrawled out a set of teeth and a pair of eye-glasses that aroused much applause from his schoolmates and the smiling approval of his teacher.

It's Teddy this, and Teddy that, the president depicted in our papers under all forms of bronco-buster, bad man of the West, a tornado of the plains. Children are accustomed to that sort of thing and grow up in that spirit of ridicule and having not one iota of respect for those whose position, if not the personality, should command at least the most courteous consideration. It's all the papers' fault, and someone should start a crusade against that form of joke. The Washington Post offers a splendid example of journalistic respectability in that connection—as in all others. In times gone by, it had mighty little use for President Roosevelt, caricatured him freely and lambasted him editorially to its heart's content. No sooner did he become chief magistrate and first citizen among us than all that was changed. There is nothing sycophantic and twaddly about the Post. It still disagrees with the president in many of his policies, and editorially criticizes him, and severely, but it does it in a respectful way and refers always to the "President of the United States." There is no "Teddying" and portrayal of bristling teeth and exaggerated goggles, and such unseemly, pernicious, demoralizing stuff as appears in so many of its allegedly reputable contemporaries. This may, perhaps, be deemed matter not pertinent to a journal devoted to construction, but if you stop to think over the question of the building trades, the tendencies to anarchistic notions, and a few other wheels within wheels, you will come to the conclusion that it is worthy of some attention.

* * *

And now Minneapolis has been singed! One after the other are our cities being visited by the "dread destroyer." It's the fate of all and only a question of time when every city in the country will have suffered more or less terrible loss of life and property by reason of the cursed habit of building shoddily. No country in the world, unless perhaps China, can show so many flimsily built structures congested into such close quarters as can we of the great enlightened United States of America. Our fathers built rather flimsily and of combustible materials; we have gotten into the habit of using the same materials, and, if anything, building more flimsily, and it will take many another big fire to knock some sense into our people. They learn their lessons hard. Born gamblers, they see what happens to the other fellow, but are willing to take a chance on eluding the inevitable themselves. Then, too, have they not the insurance companies who will stand back of them in that gamble?

The ignorance displayed by many in charge of important affairs is enough to set one's teeth on edge. Yesterday I received a letter from the mayor of a not unimportant city asking for suggestions, or a model of some sort of building law. The city was about to pass a building ordinance and he had the matter in charge, being a builder the council had left the affair with him entirely. He didn't see much use in hampering people who intended building as to the materials they were to use, and so forth and so on, but felt that they ought to have some form of regulation compelling people to take out permits, because it was very important for the assessors to know just how much was being spent every year in building! And this is 1904, mighty near 1905, and there are building experts to burn, so to speak, and cement journals and what not to disseminate light and knowledge in dark and ignorant places, mayors, etc., for instance . . . but what's the use of moralizing about it?

* * *

Mentioning China a while ago reminds me of a clipping sent me concerning the Chinese fire departments—it may interest FIREPROOF since its readers' interest was aroused, in November number, in Italian modes of fighting fires. An American tourist in China writes: "When a fire broke out in a house a few doors below the one in which I was lodging I rushed out and into the burning structure to see what could be saved. I was at once arrested and later found out the Chinese way of fighting a fire. A policeman first required an affidavit of the head of the household to the effect that he did not deliberately set the blaze, and for this purpose took him before an official half a mile away. A second was stationed to see that on one removed any furniture until the papers had been made out. After an lapse of forty minutes the firemen arrived. They looked at the burning building and decided that it was on fire. After much argument it was further agreed that it would be a waste of water to try to put out the flames. Two members who erected a ladder and climbed part way up were duly reproved for too much zeal, and after the name, age and habits of the owner had been taken, the fire department retired in good order.

"As the flames were unhindered, the house burned to the ground, and when the owner returned he was beaten by his neighbors for endangering their property. Meanwhile, I was held in durance vile for two hours and then fined 27 cents."

They do things in somewhat the same way in Cairo. There the department is a private corporation. When a fire starts the alarm is given, the different apparatuses are hauled up before the house and the chief bargains with the owner of the place, the fire going merrily on the while. If a trade is struck the department makes a bluff at putting out the fire; if there is nothing doing in the bargain line the department retires in good order and leaves the building and its owner and the adjacent property at the mercy of the whims of a mighty precarious element!

That is one thing we do indulge in to the queen's taste. We may build flimsily, and be very short-sighted in many things as far as construction goes, at least, but we certainly do have fine fire departments. It would be almost too bad to build too well and deprive these gallant fellows of the opportunity for exhibiting such feats of daring and such scientific acumen in fighting fires as we witness every day in the year in every city of the country.

* * *

It may not be amiss to note that in twenty cities whose records I have before me, 28 per cent of the fires started last year were extinguished with buckets and with out the fire department being called to aid. Thirty-three per cent was extinguished with chemical engines owned by sufferers or by the department, 17 per cent by department chemical engines and hydrant streams, and 22 per cent by steamer streams.

* * *

There are hopeful signs all about, in spite of the fact that we grow a trifle pessimistic occasionally. Let me quote you a few words from an editorial I clipped from a far southern paper commenting upon the collapse of a building in a neighboring city. It says in part: " . . . If people will not take care of themselves, or look out for their own safety, is it not the duty of those in authority to take the responsibility of watching over them? . . . A pesthouse in which patients are confined with contagious or infectious diseases is carefully guarded for the general good. Why should not this care and supervision extend to buildings? If this accident had occurred at night the loss of life would have been great. . . . Of course, it is admitted that a building may fall without blame to anyone (?) and such accidents do occur, but this was a different case. Casual observers had pronounced the building unsafe. It was cracked and undermined. It was a death trap. It should have been condemned and the people compelled to leave it. Were not the city authorities grossly negligent and are they not at least indirectly responsible for the damage to property and the loss of life caused by the accident? If the city has no inspector of buildings it *should* have one. If it has, and he allowed the building to stand there in that condition, he was criminally negligent. Anyway we look at it there is no getting around the conclusion that someone failed to do his duty. Sometimes it is necessary for the constituted authorities to supersede private rights in the general interests and for the general good. If people will not take proper precautions for their own safety, the city itself should take hold of the job. This accident may provoke investigation and insure better inspection for the future, but we doubt it. It is likely that things will go on something in the same way until another and greater catastrophe brings such a demand as cannot be ignored—after the damage is done!"

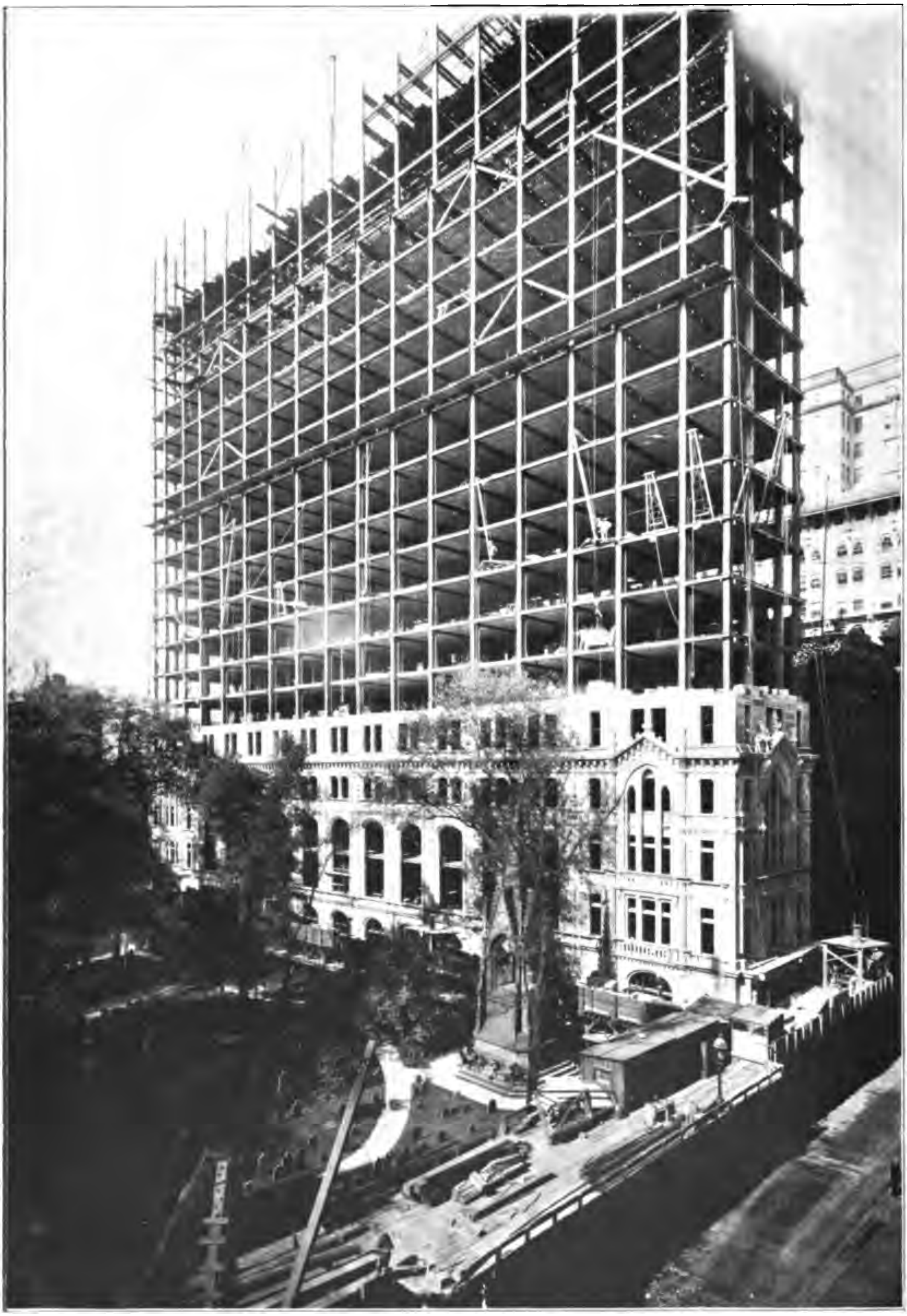
And that from a paper way down on the Gulf Coast. A good sign, is it not?

* * *

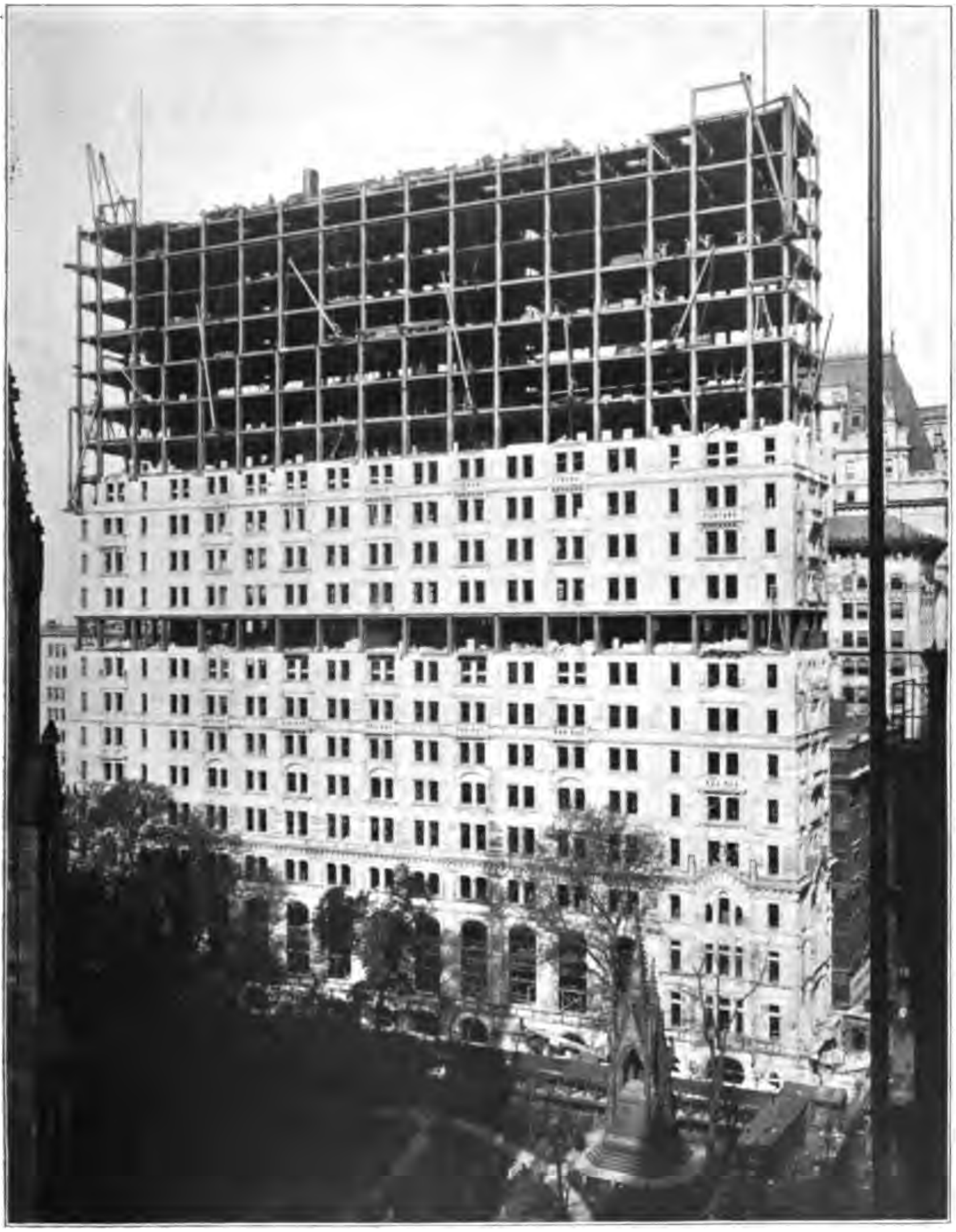
The editorial in December FIREPROOF anent "Fireproof Buildings and Fire Insurance" was particularly timely and strikes the nail squarely on the head. The 80 per cent clauses and the high rates on the small insurance written for fireproof buildings, and all the other deterrents, so to speak, that the insurance companies, perhaps unwittingly, place in the way of sound construction are bound to react against their own interests. The tendency of our business men is clearly indicated by one of the first questions I am generally asked in consultation: "Will it be necessary to carry insurance on such and such a kind of building?" Wherever an individual or company is not compelled to carry insurance by the regulations of a loaning company it is underwritten by themselves, or every effort is made to get out, as it has often been expressed to me, of the clutches of the insurance combine. A western paper tersely puts the matter thus: "It is the duty of every good citizen to pitch in and diminish the fire dangers. It is a duty well fulfilled by our citizens, as our fire record for a period of eleven years will show. The insurance combine, however, exacts a penalty from those who perform their duty in this regard to compensate it for the losses it sustains on account of those who do not. Experiences has proven that rates have been raised in spite of co-operations to diminish fire dangers. Rates are higher here to-day than they were before we had any fire protection whatsoever." The FIREPROOF editorial ought to show the insurance people the way the wind is blowing. Those gentlemen are not always over farsighted, but when their "business" is in jeopardy they may take a notion to right some wrongs.

* * *

Another hopeful sign is the interest people at large take in sound building when such matter is properly presented to them. For instance, I wrote for the December issue of the House Beautiful a little dissertation on the advantages and desirability of building houses of fireproof construction as well as our great commercial buildings. A few days after the publication appeared people began to load me up with inquiries as to how such houses should be built, what fireproofing would cost, etc. Their homes had recently burned, or they were contemplating building a new house, or for some reason or other they were mightily interested. Inquiries came from all over the country. One mail delivery brought me in twenty-seven such inquiries, earnest seekers for the truth. I tell you, as I have often contended, the people are all right, they want the right thing, and intend doing what is right, but you have to direct their attention, the initiative is what is necessary, someone to show the way and people will naturally follow—and that is FIREPROOF'S province, to hold up the beacon light of progress that all who are not blind may see. Let that be our work for 1905. This is the season of good resolves—let us forget our little interests, our selfish motives, our bickerings—let us remember our larger duties.



THE NEW TRINITY BUILDING, NEW YORK CITY.
Geo. A. Fuller Company, General Conttractors. Francis H. Kimball, Architect.



THE NEW TRINITY BUILDING, NEW YORK CITY.

Fireproofed by the National Fireproofing Company. Francis H. Kimball, Architect.

This new office building is being erected to replace the first building strictly for office purposes ever built in New York. The former building was erected by the corporation of Trinity Church about the year 1850 from plans by the late Richard Upjohn, who also designed Trinity Church. The property was sold and has changed hands several times. The monument in the foreground is sixty feet high and was built by Trinity Corporation in memory of the American prisoners of war who died in prison ships during the revolution.

THE BEGINNING OF FIREPROOFING AS PRACTICED IN JAPAN

THE marvel of travelers visiting Japan is the quaint and curious construction of the houses there. "This feature of Japanese civilization," says Edward S. Morse of the University of Tokio and a Fellow of the American Academy of Arts and Sciences, "excites more diverse and adverse criticism among foreigners than does any other characteristics; it is a constant source of perplexity and annoyance to most of them. An Englishman or American particularly, whom Emerson says, 'is he of all men who stands firmest in his shoes,' recognizes little merit in the apparently frail and perishable nature of the structures. He naturally dislikes the anomaly of a house of the lightest description oftentimes sustaining a roof of the most ponderous character, and fairly loathes the absence of a king-post, or at least a queen-post or president-post truss, while the glaring absurdity of a house that persists in remaining upright without a foundation, or at least without his kind of a foundation, makes him furious."

Yet the mistake of the occidental critic lies rather in the point of view. He fails to consider in criticizing Japanese house-structure the many other matters connected with that country. He overlooks the vital fact, as Mr. Morse puts it, "that Japan is poor," in the property sense, and he fails to appreciate the fact that for this very reason a Japanese builds such a house as he can afford and one that, after all, is fairly well adapted to his habits and requirements.

Tremendous changes, however, have come in Japanese ideals and expedients, and they are certain to work a metamorphosis in Japanese estimates of construction. They have already done so. The invasion, or adoption rather, of American and European standards of civilization has already begun to find expression in new and improved methods of building. And this is true, notwithstanding that Japanese experts have observed and reported the existence in this country of a plenty of dilapidated tenements, tumble-down shanties, and broken-down houses of ordinary and mill-construction; factories, also, not to mention cracked walls and toppling fences.

When an American architect first surveys the framework of a Japanese residence, or contemplates the cross-beams of the roof, his appreciation of the structural sentiment of "Home, Sweet Home," is thereby immeasurably accentuated and intensified.

Rein, in his great book on Japan, says "the Japanese house lacks chiefly in solidity."

But whether the Japanese house be right or wrong in its plan of construction, the point for us is that until within very recent years no such thing as fireproofing, as understood by Americans, was either known or attempted.

But the Japanese in his ignorance, or unacquaintance rather, was wiser far than the builders here who knew and who would not, for the Japanese recognizes the hazard of conflagration and deliberately plans for it; he provides for it by limitation of the sacrifice, so to speak, and builds houses whose very structure enables him to swiftly demolish them in the path of fire without the risk of incurring greater and more disastrous loss.

His mats, screens, and screen partitions can be snatched up and packed away to a place of safety in the briefest jiffy imaginable, the roof denuded of boards or ornamental tiles, and the bamboo skeleton complacently abandoned to the fate inevitable.

His net loss in such a case is small: to him it may be great, but the actual destruction relatively little.

In Tokyo the work of firemen in checking the progress of a blaze consists principally in tearing down these "adjustable structures"—it is a prevention remedy by way of destruction rather than salvage. In this connection Mr. Rein makes a very interesting observation, and that is to "record the curious fact that oftentimes at a Tokyo fire the streams are turned not upon the flames, but upon the men engaged in tearing down the building!"

The improvements now under way in construction work among the Japanese promise very material modifications; the main advance is directed now to reduction of inflammable materials employed and to the adoption of materials fire-resisting in character, and, wherever possible, fireproof.

The mean path of Tokyo conflagrations (and there have been many of them) has been ingeniously worked out by Professor Yamakawa, from data extending back two hundred years. And it is not too much to say that many of his discoveries and deductions will prove of practical interest to underwriters and builders in this country. Among them may be mentioned his study of prevailing air currents, especially in coast cities, tide winds and the alternating shift of air currents by day (and night) due to presence or absence of the sun's rays, not to mention other researches at once scientific and intensely practical. Professor Yamakawa has demonstrated the existence of the "conflagration path" in Tokyo so conclusively that the Imperial government is adopting plans for condemnation of

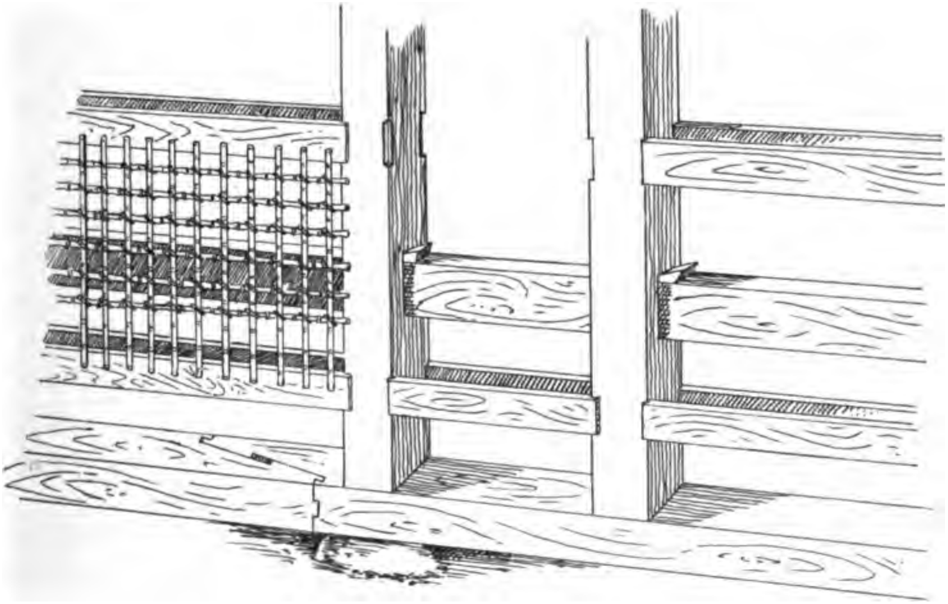


FIG. 1.

property within the fire-zone to be given over to open areas, parks and drives.

Entire fireproof blocks in American style, such as already exist on the Ginza, will probably be built in this neighborhood and along other possible fire-routes.

Since the last great fire in the Japanese capital, the authorities have specified certain districts within which shingled roofs are prohibited; where such roofs already exist they have compelled the substitution of tile roofs.

There is no excavation or cellar beneath the Japanese house, nor is there any continuous stone foundation, as with us. The framework is extremely simple: a number of upright beams running from the ground to the transverse beams and inclines of the roof above.

All vertical framing is bound by short strips let into notches in the uprights, to which bamboo lathing is fixed by still longer strips passed through mortises in the uprights and securely keyed or pinned in position.

The uprights rest directly upon rough-hewn stones driven into the ground by heavy mauls. In this way the houses have the appearance of being perched up about a foot and a half or two feet from the ground. This space may or may not be boarded up.

In the Emperor's garden there is a typical house of this character finished in simple and exquisite style. Indeed, it is said to resemble a magnificent cabinet. In this structure all the uprights rest upon oval, beach-worn stones buried endwise. To the projecting ends of these stones, about ten inches above the ground, the uprights have been actually fitted.

The effect is one of lightness and buoyancy. Yet this building has withstood several earthquake shocks and typhoons of the greatest severity, which during the summer months sweep over Japan with great violence. For these and reasons of like import, the question of resistance to vibration, and the principle of the equilibrium of forces will always be a first consideration in Japanese architecture. A result of this is that there is no concrete in superstructure in Japan.

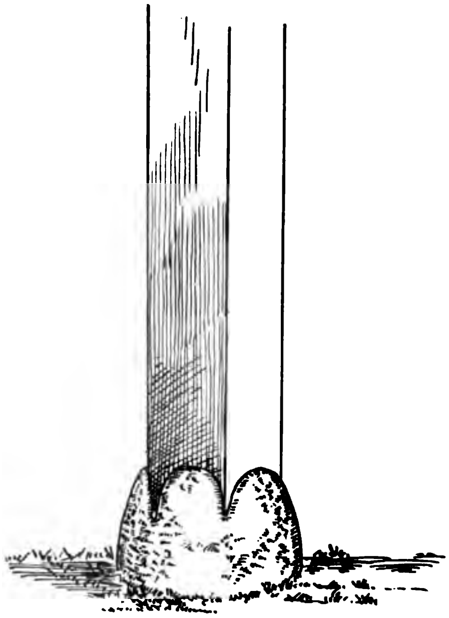


FIG. 2.

The fixed monolithic character of that system of building construction is its own inhibition under the conditions stated; conditions which confront the Japanese builder as facts and regular occurrences and not as possibilities.

Not so, however, the American method of steel and tile, with latitude for wind stress, vibration, and the elasticity of the structural parts.

The successful adoption of the American system on the Ginza, and the fireproof character of the materials used has already demonstrated to Japanese students the absolute utility of this method of construction and its preferability in the land of the Mikado.

In Japan a fireproof building or apartment is called a *"Kura."*

As yet the majority of such structures are devoted to storage uses, though some of them have already been arranged as residences and some others as stores.

They are generally two stories in height with walls eighteen inches to two feet in thickness, composed of clay plastered upon a framework of great strength and solidity —steel or iron in some cases—in others heavily massed timber. The beams are closely notched, or perforated, and where wood is used, bound with a coarse-fiber rope; small bamboos are closely secured to the beams. Short, coarse-fibred ropes, a foot in length, are secured in close rows to the cross-beams and uprights. These precautions are taken in almost all construction work of this kind *in order to secure the successive layers of plastic clay as they are applied in place.*

The centering and false work employed in Japanese building is undreamed of in this country.

It partakes of the nature of gigantic staging and *completely envelopes the building*—like a huge cage.

The fireproofing of Japan is not as yet the factory product; it is made up on the spot during the progress of the work and is applied in a plastic state and dried in position by natural agencies—entirely without artificial heat, kiln-drying or baking.

But the Japanese is not in a hurry; and even the slow processes of nature are adjudged too rapid for safety and are, therefore, retarded by the application of heavy matting over the soft clay surfaces to prevent too rapid drying out by the sun's rays. The result is that one or even two years is not infrequently required for *the setting of the fireproofing of clay* in a Japanese *Kura.*

When the walls of a *Kura* are completed a plaster mixed with lampblack is put on, which gives a fine polished surface like black lacquer. The surface finish is obtained by rubbing with a cloth first, *then with silk,* and finally by hand.

When done a newly finished *Kura* presents a remarkably solid and impressive appearance. The roofs are of immense thickness, the ridges, too, which are of enormous size, are ornamented with designs in stucco, terminating with ornamental tiles in high relief. And so much does our Japanese lover of art prize the polished beauty of the *Kura* that he very often covers the entire exterior with a close-fitting *wood* encasement to protect it from corrosion and the effect of the elements; otherwise the surface polish soon disintegrates and takes on the peculiar dull black slate color so distasteful to the Japanese.

Kura windows are extremely small, usually closed by doors of immense thickness or double shutters. Where shutters are used they have a peculiar series of rabbets, or steps, precisely like those seen in the heavy doors of a bank safe.

In our American cities we are accustomed to see the many and various fire-fighting devises, compounds and liquids, water pails, tanks, grenades, hose, etc.

Not so with the Jap.

His emergency reliance for fighting fire is good wet clay!

And this, our authorities inform us, is kept constantly at hand and in readiness for instant use. He throws it at the fire!

It may interest the reader to inquire into the use and application of tile as an exterior fire-protective and ornamental covering, as it is installed in Japanese practice.

The accompanying cut is an illustration of this feature.

These tiles are used in the cities upon outside house-walls and very generally in all the more durable structures, especially warehouses and very often in the *Kura* type as well.

They are square in form and held in place at the corners, usually arranged in horizontal or diagonal rows.

Interspaces of a quarter of an inch are left between, and the seams closed up with a peculiar white plaster spread on each side and finished off with a rounding surface.

The effect is striking in the extreme, showing the dark gray tiles crossed by the white bars of plaster.

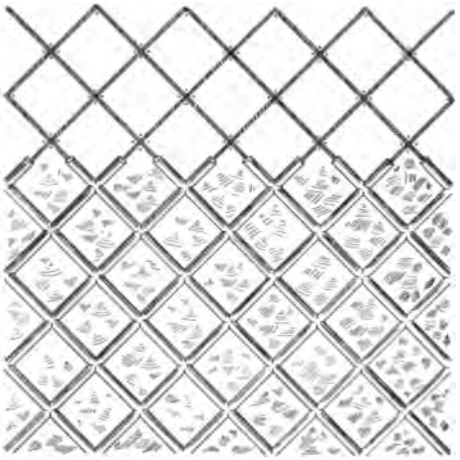


FIG. 8—ARRANGEMENT OF SQUARE TILES ON SIDE OF HOUSE.

The value of *Kura* construction for other purposes than those of safe storage is fully appreciated by the acute and observant Japanese.

Old books, pictures, documents (governmental and private), rare scrolls, and the countless treasures of Satsuma and other precious wares and bric-a-brac are carefully housed in the fireproof *Kura.*

An eminent antiquarian in Tokyo, who has been an eye-witness of two Japanese conflagrations of vast proportions, remarks upon the blind indifference of this country in its careless handling and safe-guarding of valuables, public records and manuscripts.

In short, the intense and utilitarian Jap has already begun his missionary work for fireproofing in the Orient, and the Far East may yet set up new standards of progressiveness in this sphere of enterprise, as she has already in some very different others.

Now, just a little line of comfort for our mill-construction friends and fellow-sufferers:

There is hardly any use to which iron, steel, stone or timber is put in this country that is not answered one way or another in Japan by *bamboo.*

No material in the world so nearly fills the whole bill of human necessity. In Japan they eat it; make *lanterns* of it; build with it; wear it in the form of rain coats; and sail in boats of it; they sharpen knives with it; and one species, says Paul Hasluck in his work upon woods, "Has a stem so hard that it strikes fire when cut with a hatchet." There's hope, too, for the timber interests in bamboo when the American forest is no more. A young bamboo grows 25 feet a month. It reaches a height of 150 feet and bamboo scaffolding 65 feet high is common in Japan.

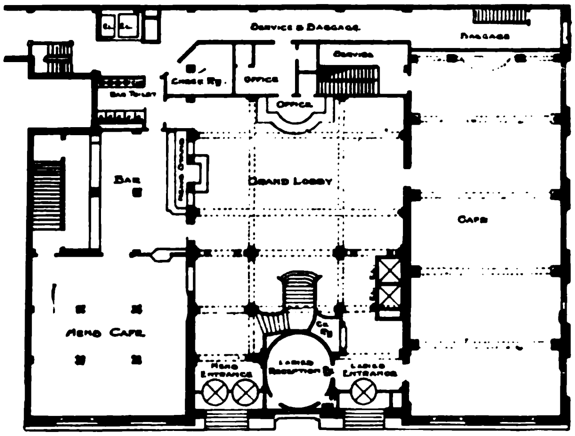
It isn't fireproof, but it *is* fire-resisting, and the hard, dense outer-coating layer resists ignition to a high degree; only when broken and the fibers exposed does it become highly inflammable. It is the nearest approach to fireproof wood yet.

But for all that the Japanese builder of today is putting his faith for the future in the *Kura,* and the fireproofing whose base is clay; the same materials and the same dependable fireproof quality wherever it is found, whether in the wild west of our own country or the far reaches of old Japan.

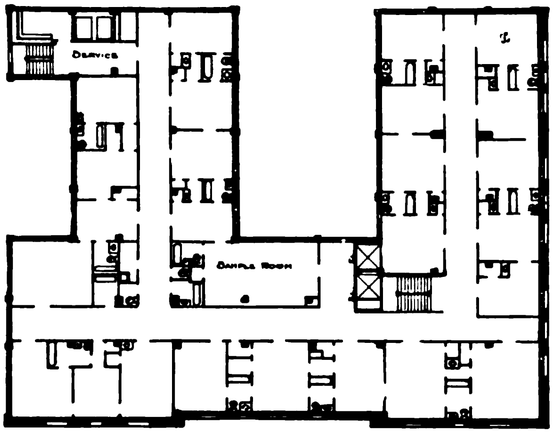
THE SEELBACH FIREPROOF HOTEL, LOUISVILLE

THE Seelbach, which forms the subject of our frontispiece, is one of the latest additions to the fireproof buildings of Louisville, which are increasing in numbers as their value is beginning to be appreciated in the beautiful city on the Ohio.

It is 136 feet long on Fourth street and 103 feet on Walnut street, and ten stories high, including the roof garden. The first floor is planned with a lobby in the center of the building approached through two entrances. Between the two entrances is a ladies' reception room. On the Walnut street corner is a large café 40x90 feet. On the left of the lobby is a men's café 40 feet square, with a bar immediately behind.



FIRST FLOOR PLAN



TYPICAL BED ROOM FLOOR

The height of the first story is 23 feet with a mezzanine over the front half of the lobby approached by a fine marble stairway. The mezzanine floor will be used for a writing room, stenographers, telephone booths, etc.

On the second story, about two-thirds of the area is given to parlors, private dining rooms, and a large banquet hall.

There will be 200 bed rooms in the hotel and 112 bath rooms. In general there is a bath room between every two bed rooms, although many of the principal bed rooms have private baths.

Besides a regular office vault back of the desk in the lobby there will be a vault provided for valuable trunks, sample cases, etc.

About half of the area of the tenth floor will be used for a roof garden, which is expected to be a very popular resort in the summer. The floor is paved with large red tiles, the top covered with rolling awnings and the parapet wall decorated with growing plants, lines of electric lights, etc. The roof garden will have its own kitchen, where meats can be cooked on a range in view of the patrons. The remainder of the tenth story will be devoted to a large hall in which both the passenger elevators will land, storerooms for the hotel, carpenter shop, work rooms, etc.

In the basement will be located the general toilet room, barber shop and billiard room. Most of the area of the basement will be occupied by the kitchen, in which no expense is spared to make it as complete and finely equipped as any hotel in the country.

Beneath the basement is a sub-basement used for storage, fan rooms, etc.

At the rear of the hotel to one side and adjoining the alley, will be located the power house, connected with the hotel by a wide passage. This building will contain all the machinery, boilers, refrigerating plant, laundry and servants' rooms.

The interior construction of this hotel will be as thoroughly fireproof as the hollow tile system can make it. All the columns and girders are protected. The floor construction adopted is the Johnson long span system, floors being built in straight slabs from girder to girder. Mr. Andrews had originally contemplated using reinforced concrete floors, but when bids were received it was found that the Johnston tile system was less expensive. The same steel construction was used as would have been the case with concrete. All the partitions are also of hollow tile.

All the woodwork throughout the upper floors will be mahogany. The bath rooms are wainscoted in marble with marble floors and solid porcelain bath tubs keyed into the wall.

The principal rooms on the first floor are unusually rich in materials and decoration. All the walls of the lobby will be covered to a height of 12 feet with delicately veined imported marble. The ceiling is deeply coffered and the space around the room between the wainscoting and the ceiling is divided into panels on which will be painted by different artists scenes characteristic of Kentucky history.

The large general café is provided at the west end with a musicians' balcony overlooking the room. The large columns between the windows are of Sienna marble with a wainscoting of the same material. The floor will be of mosaic of rich design. The woodwork of the room will be of mahogany.

The walls of the men's cafe to the left of the lobby are paneled 12 feet high in bog oak, and the whole room is designed in an unusually rich Flemish style. The use of so much wood here is, however, open to criticism.

The ladies' reception room to the left of the ladies' entrance is designed in the Louis XV. style, with richly enameled woodwork and the wall panels, covered with silk. This room has a toilet room as well as a telephone room.

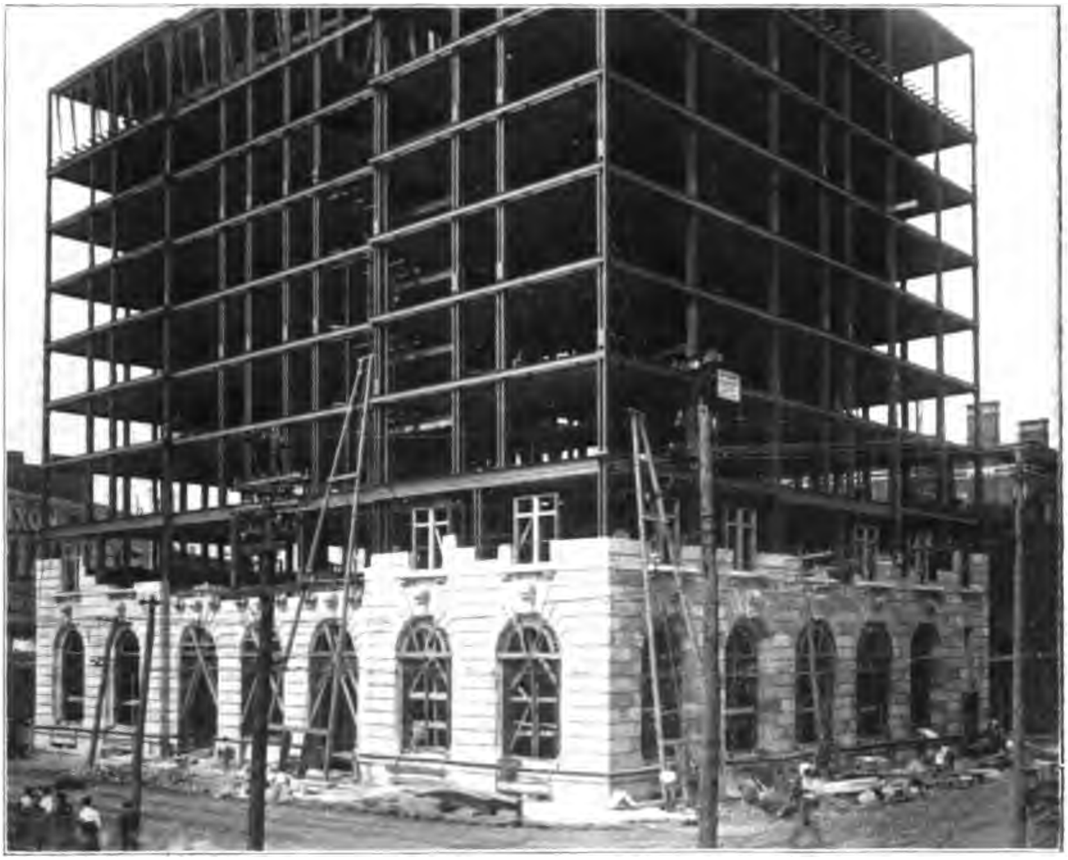
The two passenger elevators are conveniently placed near the ladies' entrance so that ladies entering will not have to penetrate the lobby to reach them.

Besides the two large passenger elevators for the guests there are two freight elevators in the service part. One of these will be used exclusively for waiters so as to insure quick service in serving meals in the bed rooms and suites.

The exterior of the hotel is designed in the French Renaissance style. The first two stories and the ninth story are of gray stone. The trimmings at the corners and around the windows are also of gray stone. The wall spaces between the third and ninth stories are faced with the Harvard brick, which is a rich-colored, rough-looking brick of a deep red color, laid in wide, deeply sunk white mortar joints.

Our illustrations, besides the frontispiece, which is reproduced from the architect's drawing, comprise the first floor plan, a plan of the bed room floors and one of the progress photographs taken by the contractor which shows the steel skeleton construction and part of the exterior walls.

The associated architects from whose design and under whose direction the building is erected are Frank M. Andrews of Dayton, Ohio, and W. J. Dodd of Louisville. The contractor for the whole is Herman Probst of New York, formerly of Chicago.



THE NEW SEELBACH FIREPROOF HOTEL, LOUISVILLE.
From a progress photograph, showing steel skeleton and floor construction.

PART V—FIRE LESSONS

BY J. K. FRIETAG.

(Concluded from November Number.)

SECOND HORNE STORE BUILDING FIRE.

BY a singular fatality, the Horne Store Building in Pittsburgh, which was damaged by fire in May, 1897, (a description of which has already been given), was seriously damaged by a second fire on April 9th, 1900, and as two of the vital defects in the design and construction of the original building were retained in the remodeled structure, it is not strange to find that these same features largely contributed to the extensive loss which resulted from the second fire.

It will be remembered that the principal constructive features which were open to condemnation from a fireproofing standpoint in the original design were the presence of unprotected vertical openings in the form of stairways, elevator wells, and a large interior light-well extending through all stories, and the unprotected character of the roof beams and columns. The building was reconstructed after the first fire, and, as the open interior light-well is a feature apparently insisted upon by the owners of department or large retail stores the world over, possibly it was too much to expect that this attractive means of lighting all floors and adding a seeming extensiveness to the structure should have been abandoned and closed up, in spite of the fact that its presence in the first fire contributed largely to the extent of the loss sustained. But that the great error of leaving the roof construction unprotected should have been repeated, in view of the tremendous damage which was previously due to this very cause through the falling of the water-tank after the collapse of the roof beams and columns, seems well-nigh incredible.* Yet this was the case, and the first collapse of the roof was duplicated in the second fire, but without the added element of the roof tank.

The second fire is supposed to have originated on the fifth floor, and the results included the general burning out of everything combustible on the fourth, fifth, and sixth floors. When about under control in these upper stories, it was found that the fire had worked down into the basement, presumably by means of a vertical shaft or dumb waiter. The first story was also burned in part, due to blazing embers falling within the light-well. The second and third stories suffered damage mainly through smoke and water.

The condition of the terra cotta fireproofing (of porous variety) was most satisfactory, and the contractor for this portion of the work is reported to have stated that renewal of the damaged portions, save in the roof, would not cost over $600. The appearance of the ceiling and the column casings on one of the burned floors is shown in Fig. 13.

The roof damage was far more serious. As in the first construction, the roof was made of tee-irons, resting upon the roof beams, and carrying 17-inch "book" tiles

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*Possibly it may be accounted for by the fact that the architect for the original building had died in the meanwhile and the architects *of great reputation*, from Boston, who reconstructed it used Boston methods in so doing.—[Ed.]

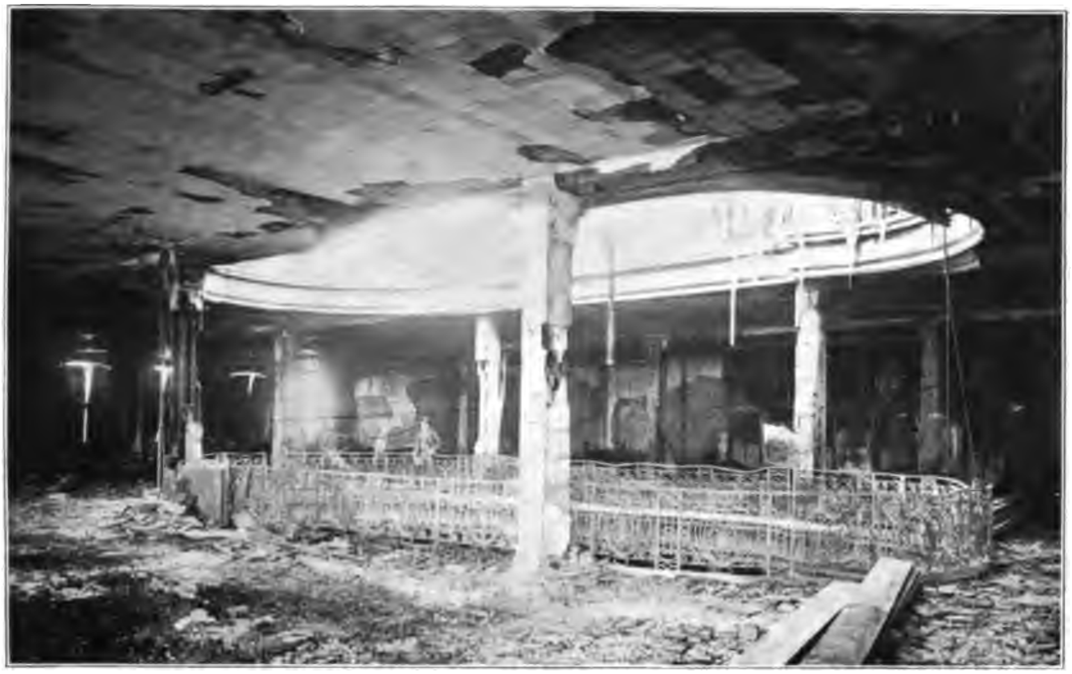

FIG. 13—INTERIOR OF BURNED STORY AFTER SECOND HORNE FIRE.
Also showing imperfect column covering crimped by longitudinal expansion.

of terra cotta, 3 inches thick. All of this metal work was unprotected, save by a false ceiling several feet below the roof. This virtually made an attic space. The suspended ceiling was made of expanded metal and plaster, applied on 1½-inch angles hung from the roof beams. This ceiling quickly "wilted" from the intense heat of the fire raging in the sixth story, thus allowing the heat to reach the roof beams and the upper portions of the top story columns. The result was the utter collapse of about one-half of the roof construction. It is greatly to the credit of the terra cotta floor arches in the sixth floor that they successfully withstood the precipitation of this great weight of debris upon them.

"This fire shows that it is possible to erect a building which can be pretty well gutted by flames and yet suffer comparatively little itself. It demonstrates that fireproofing has reached a stage justifying reliance upon its efficacy, and warranting the belief that in such an ordinarily severe fire as that described, the loss is to be attributed to the design of the building, for which the owners are undoubtedly responsible, and not defective fire-resisting construction."*

THE PATERSON (N. J.) CONFLAGRATION.

Save the recent Baltimore conflagration, the fire which swept the city of Paterson, N. J., in 1902 was the most disastrous which has befallen any American city since the introduction of modern fire-proofing methods; and although few fire-resisting structures were included within the burned district, still the results of this widespread destruction furnish many valuable lessons as to the behavior of fireproof construction under conflagration conditions. The importance of this test upon fireproof buildings, which were practically surrounded by the very worst character of non-fireproof structures, has, of course, been largely dimmed through the magnitude of the more recent, more extensive, and more conclusive disaster at Baltimore. Nevertheless, certain conspicuous lessons stand out in the

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*See The Engineering Record, April 14, 1900.

Paterson fire, not only of great value in themselves, but of added value now in confirming or disproving certain deductions which have been drawn from the Baltimore experiences.

The Paterson conflagration occurred on February 8th, 1902, starting in the carsheds and repair shops of the Paterson Railway Company at midnight, while the wind was blowing sixty miles an hour. The fire raged for nearly twenty-four hours, destroying approximately ten city blocks in the heart of the business area, besides an area almost as large within the residential district, where the conflagration was communicated by means of flying sparks and embers nearly a half-mile distant from the first fire.

The general construction of the burned mercantile district was of the dangerous, non-fireproof character, consisting mainly of old brick buildings with frame structures scattered between, and here and there an isolated structure of approved fire-resisting design. The city building laws had long been a dead letter, and it was no difficult matter to secure permission to erect almost any kind of a building at almost any location. The result of the fire showed the folly of such laxity, and similar experiences at Waterbury, Conn., and at Baltimore have now proved conclusively, if added testimony were required, that *uniformity* in fireproofing requirements should be the law within all congested areas in our large cities. "Fireproof buildings must stand in fireproof cities," for there can be little inducement to the individual owner to erect fire-resisting structures when his neighbors can jeopardize his investment by constructing dangerous fire risks on every side. Surely our intelligent citizens and their "city fathers" need no more proof of the necessity for absolute uniformity in fireproof construction than has been afforded by the fires of Paterson, Baltimore and Rochester.

But that individual fireproof structures are of some avail, even when surrounded by highly inflammable neighbors, was also plainly demonstrated by the Paterson fire. Such structures may be pretty thoroughly burned out in themselves and yet prove of inestimable value to property beyond. Possibly this is small consolation to the owner, but as fireproof structures multiply within a given area, just so is the possible efficiency of each increased through the added security afforded by each new structure.

The effect which one adequately fireproofed structure may have in preventing the spread of a conflagration beyond was well shown in the Paterson Savings Institution building. This was a five-story and basement building at the corner of Main and Market streets, and the spread of the conflagration to the south and west was completely checked by the fire-resistance offered by this structure. The principal resistance to the progress of the fire lay in the blank brick walls on the conflagration side, but the fireproof floors made of the Guastavino system also served to protect the interior, and hence to save the building from utter ruin. As it was, the contents of the top two stories were entirely consumed, but structurally the building was without serious damage, a splendid tribute to fireproof construction.

The most interesting test afforded by this fire was the beautiful new City Hall building, shown in Fig. 14. This was of four stories and tower, about 75 feet by 150 feet in area, with Indiana limestone façades and floors of terra cotta arches. Three sides of this structure were exposed to the raging conflagration, at distances ranging from 60 feet to 150 feet. Across one 60-foot street was an entire block made up of non-fireproof store buildings which were all on fire at one and the same time, the nearest and also the most dangerous of which was the Romaine office building. A solid mass of flame from this structure was blown against the west wall of the City

Hall, while the north and south sides were also subjected to extreme heat. The result is well shown in Fig. 14. The entire combustible contents were consumed, including all of the wood trim, the furnishings and the city records, except in one room where, strange to say, even the carpets and furniture were untouched. The stone ashlar was completely disintegrated, especially at corners and at window soffits, but the floor arches were intact and the integrity of the tower was unimpaired.

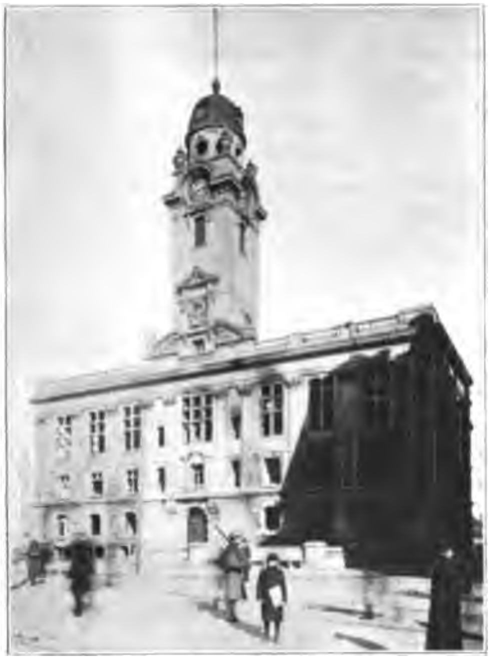


FIG. 14—THE CITY HALL AT PATERSON, N. J., AFTER THE FIRE.

But the principal interest in the test of this building seems to lie not in the structural damage done to the City Hall itself, as the result only furnishes another example of the fact that bad losses must be expected in even the best of fireproof buildings which are exposed through unprotected openings, and not in the damage done the limestone ashlar, as this was a result most certainly to be expected, but rather in the fact, as in the case of the Paterson Savings Institution building, that a fireproof building may be completely gutted in itself, and still afford effective protection to structures beyond. Speaking on this point, the report on this fire issued by the Continental Fire Insurance Company states as follows: "The City Hall, which was surrounded on all sides by unprotected openings, also affords a good example of the fact that a fireproof building is not an exposure to another fireproof building, *under ordinary conditions,* as in this case it acted as a break and prevented any damage of importance being done the fireproof Second National Bank building, only 50 feet distant." It is interesting to note that this deduction was verified in the Baltimore conflagration through the manner in which the fireproof character of the Baltimore Herald, Calvert and Equitable buildings undoubtedly saved the magnificent Court House, which would surely have been destroyed, and beyond that no one can even estimate how many more blocks, had these three buildings in the path of the flames been of a non-fireproof and hence collapsible character.

ROOSEVELT BUILDING FIRE.

The fatal fire which occurred in the Roosevelt building, New York City, on February 26th, 1903, was fully described in FIREPROOF MAGAZINE, March, 1903; but a few brief references to the lessons of the fire are worth repeating.

This was an eight-story building, erected in 1893, and supposed to be thoroughly fireproof, but the destruction by fire of the upper stories developed the fact that *unprotected* cast-iron columns, in combination with steel floor-beams and segmental terra cotta arches, had been considered efficient fireproofing, else why should the expense of fireproof floor arches have been justified, if unprotected cast-iron columns had not been considered equally fire-resisting? The result is shown in Fig. 15, and of eighteen 7-inch columns supporting the roof, three only remained in perfect condition. The remainder were either broken or warped, a repetition of the experiences in both the first and second fires in the Horne Store building.

Another important lesson was taught by this fire through the enormous damage done by water to the clothing stock in the lower stories of this building. This point is generally overlooked by both owners and architects, but in buildings containing large or valuable stocks or merchandise, the ordinary detail of wood floor upon some form of fireproof floor arch is not capable of properly protecting the stories which may be located below the seat of the fire. A finished floor of Lignolith or cement, laid to pitch toward scuppers, would entirely obviate this risk.

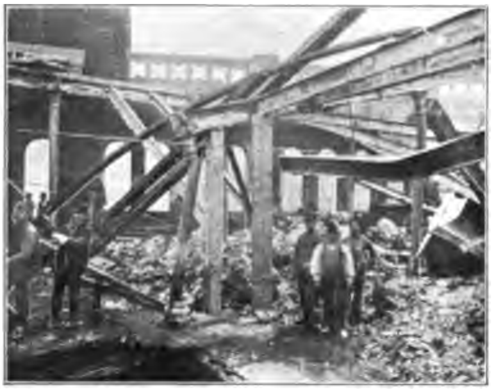


FIG. 15—INTERIOR OF ROOSEVELT BUILDING, NEW YORK CITY.

Showing roof beams and girders after collapse of part of unprotected cast-iron columns.

The most regrettable feature of this fire lay in the death of one of the fire department captains, by stepping through a marble stair platform which he doubtless considered firm and safe, but which had been cracked or completely broken, either by the disintegrating effects of the heat or by the precipitation upon it of debris from above. The platforms of successive stories below also failed under his fall, and death resulted. Had this building been erected since the enforcement of the present Greater New York building law, this could not have occurred, as sub-treads of iron are now required under all slate or marble stair treads and platforms. The wisdom of this requirement was also well attested in the various experiences gained at Baltimore, where slate and marble stair treads, and especially larger platforms, were everywhere found to be dangerously cracked, if not gone altogether.

CONCLUSIONS.

It was pointed out in Part I of this article that obviously the most valuable tests of fireproofing methods are to be found in those actual fires which have occurred in buildings intended by their construction to resist fire. Such tests are always unexpected, and hence represent practical conditions of everyday occurrence; at the same time both good and bad features of construction, mistakes, omissions or weaknesses are made manifest, as well as those enduring qualities which justify the faith reposed in them. Although scientific research and investigation and comparative data as to the fire-resistance of various materials are exceedingly valuable, and hence greatly to be desired, still, such specific tests are not to be compared for practical utility to those actual tests afforded by the burning of fire-resisting structures; and it is for this reason that the fires in the Minneapolis Lumber Exchange, in the Metropolitan Opera House, in the Chicago Athletic Club building, in the Temple Court building, in the Horne buildings in Pittsburgh, in the Vanderbilt building, in the Home Insurance and the Roosevelt buildings, as well as the Paterson conflagration, have been examined in sufficient detail to bring out the more interesting or the more instructive lessons for guidance in present or future practice. Little, except of a comparative nature, has been said regarding either the Baltimore or the Rochester conflagrations. These great object lessons are still so fresh in the mind, as is the Iroquois Theatre horror, that no added comments are necessary to bring home the truths which they demonstrated.

Many other fires besides those here described have also occurred in fireproof buildings, and some of great value for purposes of study in even non-fireproof buildings, but the above mentioned fires constitute most of the better known and certainly the most frequently quoted instances, so that the aggregate of the experiences afforded by these examples may safely be taken as a fair and safe standard from which to derive certain deductions.

Considering, then, all of the fires described, in connection with the Baltimore and Rochester conflagrations, it must be admitted that, beyond all peradventure, buildings *can* be rendered fireproof in their essential structural parts, against even the severest tests afforded by unusual conflagration conditions. It may be questioned whether any single structure has actually demonstrated this. Possibly not, to a full extent; but considering the very commendable showing made by several of the structures in the Baltimore fire, if we should add to their good points certain other features which have amply demonstrated their worth, the resulting structure, were the experiment tried, could certainly far surpass in fire-resistance even the best which has so far been done.

If we fully appreciated the lessons of the past, conflagration conditions would become impossible. Paterson, Baltimore and Rochester all demonstrated the crying necessity for uniformity in our laws relating to fireproof construction. Every extension of fireproofing requirements lends added security to every new building, as well as to its existing or to its future neighbors.

If uniform requirements cannot be secured, Paterson shows how most effective results can be secured through the use of blank walls abutting dangerous risks, while Rochester shows the folly of allowing unprotected openings between a fireproof structure and a hazardous neighbor. The value of a fireproof building as a fire-stop, or as a protection to other structures beyond, was also illustrated by the Paterson Savings Institution and by the Paterson City Hall.

The external hazard furnished by dangerous neighbors and the necessity for adequate protection against such hazard was plainly shown in the Temple Court building, the Vanderbilt building and the Home Insurance building. If blank walls are impracticable, remedy may be found in fire-resisting shutters, or in metal window frames and sash combined with electro-glazing, prisms, or plate wire glass.

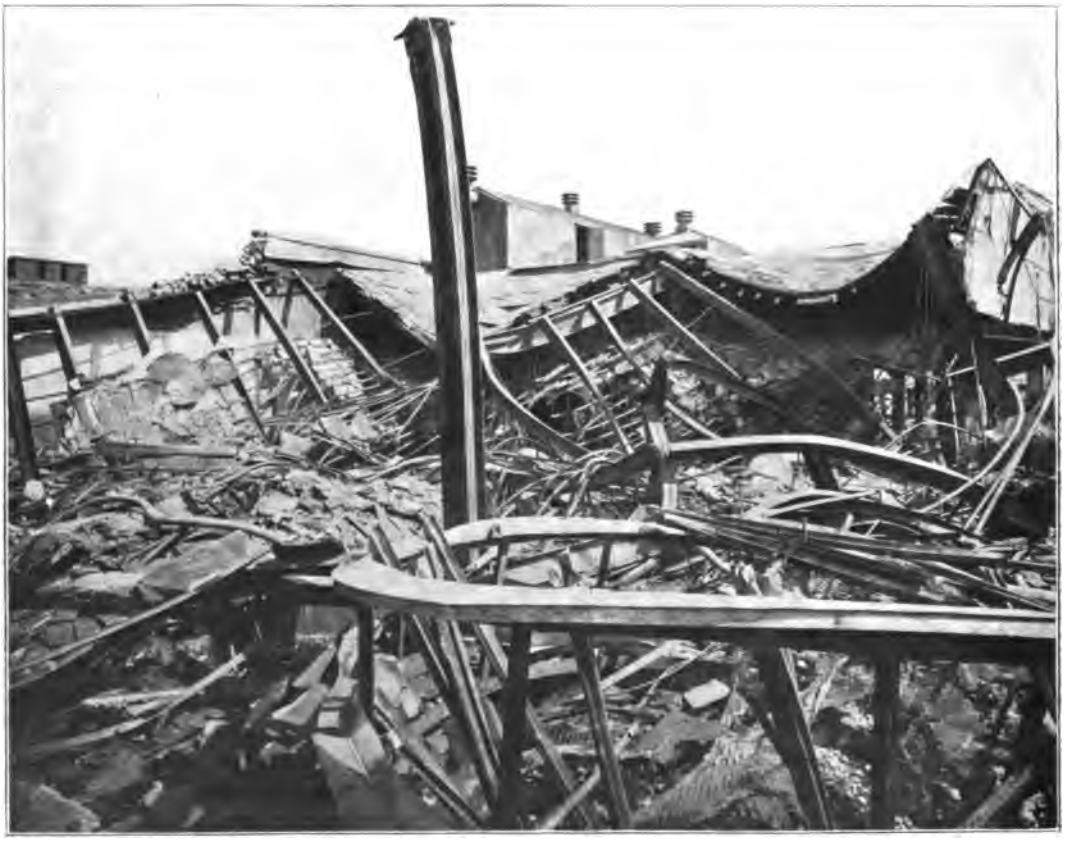
Certain fundamental facts regarding the successful planning of a fireproof structure are also emphasized through these fire lessons. The Horne Store building showed how rapidly and effectively fire may be communicated by means of light shafts, dumb waiters, and other vertical openings. The Metropolitan Opera House fire developed many serious defects in planning, especially with regard to the safety of those actors and actresses who used the gallery dressing rooms, and even with regard to the audience on account of unprotected proscenium openings. The Vanderbilt building fire illustrated how crooked and poorly designed stairways may hamper the effective working of the fire department.

The efficiency of terra cotta, used as a constructive or protective medium in connection with steel frame methods, was amply demonstrated in *all* of the examples quoted. The failures of terra cotta which occurred were due, not to the use of this material, but to half-way design, omissions or economy at vital points, faulty details, or the improper use of proper materials.

False economy, or careless fireproofing, will be found responsible for many seeming failures in fire-resisting construction. Witness the totally inadequate floor construction of the Equitable building, Baltimore, the unprotected roof construction in the Horne Store building, with its disastrous results in two fires, and the lack of fireproofing around the columns of the Roosevelt building.

Examples of the improper use of materials are afforded by the Chicago Athletic Club building fire, where wood nailing strips were used around important load bearing columns, by the Temple Court and Horne Office buildings, where terra-cotta partitions were built upon the wood floors or upon wood nailing strips, by the Horne Store building, where wooden lookouts were employed in the cornice, by numerous instances where light metallic construction combined with plaster have been relied upon to furnish fire resistance, and in Baltimore, where Lime-of-Tiel was used.

Faulty details which have been so glaringly shown up in tests by fire are almost too numerous to mention. Innumerable partial or total failures have occurred in floors, column protections, partitions, walls. It is manifestly unfair to hold steel and terra cotta construction responsible for the damage resulting from the use of improper materials, or from the non-intelligent use of proper materials. Serious mistakes have been made in the past, and many faults still remain to be corrected, but as a safe construction to rely upon in the emergency of fire-test, no material which we now know anything about offers the satisfactory groundwork for improvement or perfection which is found in terra cotta. Fireproof building design and construction in general, and terra cotta in particular are still far from perfect, but if the lessons of past experience are taken to heart and used as the basis for improvement and progress, still more efficient fire-resisting structures will surely result.



DESTRUCTION OF ROOF OF HORNE STORE BUILDING IN SECOND FIRE.

Mecca, The "Holy City."

By J. W. Fitzpatrick.

> " . . . When men said to them, 'Verily, the Meccans have mustered against you; therefore fear them!' it only increased their faith . . . "
>
> —Koran, Sura III.

TO the "Faithful," the true followers of the Prophet, Mecca is the embodiment of all that is holy, the spot to which all eyes are to be turned, the very ticket office to Heaven; while to us unbelievers, Christians, Jews and "dogs of Gentiles" generally, it is looked upon with fear indeed, one of the most fruitful sources of disease, an "annual menace," if not a constant one, to the health of the world. Of all the places where filth and ignorance of all sanitary laws prevail, birth places of cholera, plagues and other epidemics against which our civilization has to guard, Mecca is worthy of our most earnest solicitude, for from it are the seeds of dread diseases most zealously scattered, and to the remotest corners of the earth.

The "bubonic plague" or "black death," an essentially oriental luxury, and one particularly indulged in by the pilgrims to Mecca at this time of the year (and carried back by them to their homes all over Arabia, Turkey, Africa, Persia, India and the Pacific Isles, and from those places transported via commercial media to pretty nearly every seaport in the world), is one of the most terrible forms of epidemical disease man can be victim of. It is only by the most careful watching and the enforcing of the most drastic rules that our ports are kept free from that dread visitant, a task that becomes more and more arduous and trying to our marine hospital service doctors as our trade with China and communication with our new cousins of Hawaii, the Philippines and Sulu increases.

We all remember the scare we got when Honolulu was laid hold of by that ravager in December, 1899. About that same time it also appeared in Portugal, carried from there to Santos, Brazil, and thence two cases to New York, so that we had to guard both sides of our continent at the same time. That eternal vigilance is necessary is shown by the fact that two pretty well-developed cases were headed off from an Atlantic seaport but a few days ago.

The last time that it ravaged Europe in epidemic form was in 1879, when it swept along both banks of the Volga. In '93 it broke out in Tonkin and in Hongkong and was carried from there, by sea, to Bombay and British India. In Bombay alone it laid low 164,000 of the inhabitants. Why, in the "plague belt," that strip as wide as the Red Sea is long, and from the latter to the Pacific, there have been but nineteen years since 1850 in which the "black death" has not stalked about in some one of its countries just about this season, or soon after that confounded pilgrimage to Mecca.

In times past, when there was much less sanitary precaution taken against its ravages, and earlier still, when it was "sinful to attempt to stay the hand of an avenging God," the havoc that disease made was simply awful. London lost 69,000 of its 460,000 people in 1665, and that, too, after two-thirds of that population had fled the city. It is recorded that 25,000,000 people died of it in the fourteenth century. In 1446 40,000 people perished by it in Europe, where it was first introduced in the sixth century, A. D. In 542 A. D., Constantinople lost 10,000 people in a single day by that scourge. Livy tells us that over a million people were destroyed by it in 221. We know that Athens was visited by it in 429 B. C., and that eighteen months later she lost fully a third of her population by a second visitation. That it was known and feared even during the reign of Egypt's earliest kings we are assured by that celebrated writer, Manetho, who flourished in the third century B. C.

To Venice is due the credit for taking the initiative in establishing quarantine and other precautions against the "black plague" way back in the early fourteen hundreds.

Dr. Wyman, the chief of the United States marine hospital service, has declared, after most careful research, that of the people attacked by that disease seldom over 50 per cent recover, and more generally the death rate is 90 per cent and over!

Statistics in Arabia are difficult to gather always, but about pilgrimage time, and in Mecca, they are not in good form at all; in fact, we know that any "unbeliever" bent upon any such errand would have scant semblance of a form left when the "children of the Prophet" got through with him, so that it can be but roughly estimated that 112,000 pilgrims were in that city on March 29 last for the feast of Kurban Bairam—a greater number than have gathered there for years. The French government, that for eight years, for sanitary reasons, has prevented the clearing of "pilgrim ships" from its port of Algiers, removed the ban last year and extra thousands consequently sailed from and returned there. Then, too, the sultan of Turqey, ever exceedingly desirous of "raising the wind," particularly to complete his pet scheme, the Hedjaz railway, issued a proclamation, or edict, that the skins of all the sacrificial sheep slaughtered at Mecca this year should be sold and the cash turned into the imperial treasury, and that took many pious pilgrims there upon commercial dealings intent. Whatever the cause, the crowds have been great, sickness among them most prevalent and deaths most numerous, and to the civilized world the warning has been sent forth, "Look out!"

Carry those thousands, huddled in ships like sardines in a box, eating "high" meats cooked in rancid oil—pet Arabian dishes—drinking putrid water, and let them be as nasty about themselves as Arabs can be—and if you have not traveled among them you cannot appreciate how very nasty that is—let there be as little sanitary care taken of those ships as possible; let them travel slowly to save steam and let the sun shine down on them with steam-raising fierceness. Then let other thousands, as ill-fed and ill-cared for, come over the ill-kept roads into Mecca, then huddle them into accommodations ill-sufficing the 70,000 regular inhabitants, into tents and sheds, and keep them there in fast accumulating filth for a month or so; let the high sheriff, the feudal lord of that district, snap his fingers at Turkish rules and sanitary regulations, and Heaven knows they are few and ineffective enough; add a lot of other ills to the situation, and you will be able to account to yourself why it is that some years scarce two-thirds of those pilgrims get back to their homes.

That fact is about the only safeguard the world really has against the wider spread of the pestilence. These people come from such great distance that those infected with the disease develop it and die by the roadside before reaching their homes—for the rest of humanity certainly a most providentially enforced quarantine.

* * *

Arabian traditions and sacred books tell us that Adam and Eve, after their fall, wandered for centuries apart, but met again upon Mount Arafat, just out of the present city of Mecca. There they prayed God for a tabernacle, and one of clouds was given them. Upon their death it probably blew away. Then Seth built one of stone upon the same site. They did not get it into the ark quickly enough, so during the deluge it *floated* away. Later Hagar and Ishmael slaked their thirst at a well near by, the well of Zem-Zem, and huge Amalekites, approaching the well from across the desert in another direction, were well pleased with its waters and with Hagar, so they established a city there. Later these Amalekites were gotten rid of. Ishmael remained there with the new inhabitants, sons and daughters of near-by tribes, married the daughter of the ruling prince and is laid claim to today as great granddad by pretty nearly the entire population of Mecca.

Soon after reaching man's estate he was ordered by God to rebuild the tabernacle, Kaaba, where had stood the cloudy affair of old. Papa Abraham helped him, and the old gentleman, not being particularly nimble in clambering around a scaffold, a miraculous stone was placed for him to stand upon, and it moved up and down and sidewise, just as that ancient mason wished to be shunted about. You will be shown the stone by your dragoman when you visit Mecca, and you may still see the imprint of the patriarch's number 14 sandal upon its surface. It is a most venerated relic.

THE KAABA IN THE COURT OF THE GRAND MOSQUE.

While they were engaged upon this holy work the angel Gabriel, to encourage them, I suppose, brought them down a stone, a dazzling white jacinth, from Paradise, as a testimonial of good faith, or something of that sort—traditions are a bit mixed upon the subject—which they "received with proper reverence" and immediately inserted it in a corner of the Kaaba. And that is the sacred stone that has been kissed black during all these succeeding æons of time. At the resurrection it will pass through some sort of spiritual laundrying that will give it its pristine whiteness, and, being carried back to Heaven, will there be kissed for all eternity by angels whose ethereal lips, it is hoped, will not make it necessary to ever again lave its snowy surface.

That stone and that tabernacle were the objects of the greatest veneration in far remote times, and Mecca the objective point of millions upon millions of tribesmen.

It is more than probable that these people, who in Mohammed's time were rankly idolatrous, and had erected each tribe its own special idol within the sacred precincts of the Kaaba, had not lost all idea of their ancient monotheistic worship and still rendered a vague sort of homage to a supreme God, the God of Abraham and of Moses.

Then the great Meccan appeared upon the stage, the one true Prophet—Mohammed. It would be interesting to follow him about that sacred city and note, oh, so much of such vital import to the world's affairs that occurred to him thereabouts, but time will permit but a glimpse at him before our curtain must needs be rung down.

His uncle, Abu Taleb, was the priestly keeper of the Kaaba, so that even as a youngster the Prophet had boundless opportunities to study the characteristics of different peoples and individuals. He was not slow in realizing, too, the grip that ancient creed still had upon them and the necessity of giving them some visible object to reverence, a something supernatural to hold, to fight for. And, indeed, all through the new and iconoclastic faith he devised—that, after all, and in spite of the Moslems' hatred of the Jews, was but an offshoot of true Judaism with a dash of Christianity—he wisely preserved the sacred character, the "holy of holies" idea about the Kaaba.

It certainly stood him in good stead once. At a time when even his own people scoffed at him and at his "visions," when he was feeling particularly blue, he happened to pass through the gateway of al Haram just at the time a violent dispute between two chiefs of tribes was going on as to which should replace the sacred black stone in the wall of the Kaaba, that had been undergoing repairs after a fire had damaged it. Instead of resorting to blows—as we must admit Arabs and others generally did and still do—they had agreed to let the first person who came in at that gate arbitrate the matter.

Mohammed was that person; sent by God, of course. He looked wise, scratched his head after the manner of men, and decided they should place the stone upon a shawl and *all* hands carry it thus to its destination, when *he* would put it into its final resting place. This Solomon-like verdict so pleased all parties that they looked upon him as a great and wise man. Scoffers held their peace, new followers gathered about him and there is just cause to assume that this little incident was the real turning point in his career.

He established certain rites and feast days to be observed at Mecca, about that sacred shrine; every Moslem has to visit it once, at least, during his lifetime; in fact, Islamism may be said to center about Mecca as Judaism does about Jerusalem and Catholicity does about Rome. " . . And proclaim to the peoples a pilgrimage: Let them come to thee (the 'Holy Mosque') on foot and on every fleet camel, arriving by every deep defile, that they may bear witness of its benefits to them, and may make mention of God's name on the appointed days, March 29, over brute beasts with which he hath supplied them for sustenance. . . . Then let them *bring the neglect of their persons to a close* and pay their vows, and go in circuit around the sacred house. . . . In it are evident signs, even the standing place of Abraham, . . . God's mark (the sacred stone) from Heaven, . . . and wherever ye be, turn your faces toward the sacred Mosque. . . . " So saith the Koran; and there you have a whole lot of Mohammed's principal ordinances in one little paragraph. His insistence upon a pilgrimage; an order to sacrifice animals, the sacrifice of Kurban Bairam; orders to wash, hence the bathing of the multitudes in the pool of Zobaida (a most admirable method of propagating disease) at Muna, near Mecca, and the inward bath or drinking of the sacred waters of Zem-Zem, into which, by the way, seeps much sewage; the processional tour of and prayer at the Kaaba; the latter's sacred character and the rule that all good Moslems, wherever they be, shall pray facing that holy structure.

And those ordinances have been kept more rigidly and with a greater fervor than have those of any other creed or sect, right through the ages and to the present time. The Jews of to-day observe their rules and forms, we think, most strenuously, but if you become acquainted with true Islamism Jewish punctiliousness will appear most perfunctory. Every true Mohammedan, though he live at the Antipodes, will make that pilgrimage once, at least; it is the event of his life, and he will go through the entire performance as if his future happiness depended upon it. I do not say his life, for that amounts to little; this is but a transitory state, a sort of purgatory; his real living begins *beyond,* where he will toot golden flutes, quaff nectar and bask in the sunny smiles of black-eyed houris—"no blondes need apply!"

A BEDOUIN HIGHWAYMAN.

There is no ordinance upon the subject, but merely for mutual protection and economy these people flock to Mecca during the month of March in great caravans. These follow, year after year, the same old routes. There is that of Damas, of Djebel-Shammar of Nedjd, of Yamen and that of Djedda, which last, together with the first, are the most frequented.

One of those caravans is a great sight; it makes you think of a circus en route. When they halt tents spring up all about as if by magic. The thousands of sheep and goats and cattle, sacrificial offerings to God and food for man, are yelled at and pushed and driven into a sort of corral; there is more or less order about the movements, but a veritable pandemonium of sounds. There are fakirs and vendors of sorbet and tobacco, and what not, crying their goods. Valets of the great men insisting upon the best camping places for their masters, children crying, guns being fired in jubilation that the pilgrims are so much nearer their objective point; why, a circus is not a circumstance to this.

You will observe a few here and there who seem to be having a hard time of it. They are Chiites or Persian Mussulmen, true believers, but who do not accept the legitimacy of Mohammed's first four successors. They are shoved about and abused. You may easily pick them out; they wear a sort of tall hat and are as white as we are almost; an Indo-European race, models of politeness and consideration, striking contrasts to their turbaned cousins, who greet them somewhat in this language, "Out of my sight, cursed one, son of a thrice-accursed father! Hog brother to a sow!" Pleasant to be a Persian faithful one, is it not? They are taxed double the amount anyone else pays and have a sweet time of it altogether.

Through certain sections of the country

these caravans are taxed for passage, but are accompanied by troops of the local governor or sheik for protection against bandits and lesser governors. Sometimes these troops have turned about and plundered the caravans themselves. That was done not so many years ago in the city of Bereydah and at Hail. Roving Bedouins are the principal danger, however.

The caravans that meet at Damas and thence proceed together to Mecca are the official Turkish ones. That from Constantinople last year was a particularly grand affair. It was sent out by the sultan himself, "the servant of Mecca," and was composed of soldiers, pilgrims and priests, bearing rich offerings and escorting the gayly decorated "sacred camel." That caravan had to pass through a more or less rebellious district, and probably Abdul-Hamid got up a particularly imposing and gorgeous affair to properly impress, to have a moral effect upon his bumptious subjects.

The most important route of all is that of Djeddah, a seaport on the Red Sea, and about an eleven hours' tramp from Mecca. There assemble all the faithful who come in ships—the order to "come afoot or upon fleet camels" is read to apply *from* that nearest seaport only.

In Mohammed's time and for years after the first great expansion of Islamism, wonderful fervor was thrown into these pilgrimages, and far greater numbers made them than have ever done so since. The caliph, El Mohdi Abou-Abo-Allah, spent several millions of dollars upon one of his. He built roads and way houses and what not all the way from Bagdad to Mecca. Haroun-al-Raschid vowed he would make a pilgrimage afoot did he ever attain the caliphate. He reached that goal, stuck to his word and tramped all the way to Mecca from Bagdad. Eight times did he make that pilgrimage. Upon one of those fervent marches he gave away $30,000 in charities alone. The great sultan, Mokteder, made three pilgrimages and at one time offered 40,000 cattle and 50,000 sheep in sacrifice. The mother of the great caliph, Motasem Billah, was followed by a train of 120,000 camels. In 1814 Mehemet-Ali went to Mecca dressed as a common hadji, covered with the simple ihram, but was followed by a magnificent train. One of his wives, the mother of Abrahim-Pasha, had 500 camels to carry *her* baggage; her tent was "eight hundred paces about"—a veritable three-ring circus tent—and her charities made the poor Meccans happy.

I forgot to mention, when I said that every true Moslem had to make this pilgrimage once in his lifetime, that under certain conditions he may send a proxy, or, if very poor or sickly, he may get a dispensation, indulgence or release from that obligation.

A pilgrim is enjoined by the Koran to observe certain laws in that march; he is to commence no quarrel; he is to bear all harshness and reviling and must promote peace and good-will among his companions. Moreover, he is to give as much in charity as he possibly can. At some distance from Mecca he allows his hair and nails to grow, strips to the skin and dons the ihram—two scarfs of any stuff but silk, plain and without seams. One of these is folded about the loins, the other is thrown over the neck and shoulders. A special sandal is worn that leaves the instep uncovered, and the head is bare, though an umbrella may be carried. The female ihram covers even the eyes, the wrists and the ankles. This garb is to be worn, regardless of the weather, until the pilgrimage is over. Abstinence in "thought, word and action" is the rule, and one must not indulge in any act of violence, not even the killing of "insects that may infest him!"

Reaching Mecca, our pilgrim pays little attention to his baggage or other worldly affairs; his concern is his religious duty and to perform it well. Alone or guided by a Metowef, the official guide, he repairs to the mosque, enters it by the "gate of salutation," makes four prostrations, says certain prayers, then approaches the sacred Kaaba, makes four more prostrations opposite the black stone and kisses it, or, if prevented by the great crowd all about, he touches it with his fingers and kisses them. That stone, he may notice, is now a jet black and is cracked almost down the middle. Spite of its heavenly origin, it went the way of all things material and was badly broken in the great fire of 683 A. D. The pieces were neatly joined, however, and are held in place by a silver setting. But our pilgrim has scant time to note these trivial details. He makes seven circuits of the Kaaba, the "three first circuits quickly, the latter four in slow and solemn pace," always keeping his left side to the building and kissing the stone every time he passes it, muttering heartfelt prayers all the while.

This procession ceremony is very ancient; they call it the Towaf. Before Mohammed's time they, both sexes, made those circuits stark naked. The Prophet introduced the more decent ihram.

Next in order our friend presses his breast against the wall between the black stone and the door, and, with arms outstretched, he prays for pardon for his sins. He then repairs to the station of Abraham, the Makam, makes four more prostrations and asks that patriarch's help in living so as to merit Heaven. Thence he goes to the well of Zem-Zem and drinks of its clear-looking but very microby water, just as much as he can hold. Of course, if it is his first pilgrimage the Metowef has to do a lot of coaching. This guide and director of prayers next leads him out by the gate Bab-el-Zafa, up the hill of Zafa; there are more prayers, then he begins his holy promenade, the saa, seven times up and down along a street, Al Mesaa, sometimes walking slowly, sometimes running and looking here and there, evidently in great distress. This is to recall poor Hagar's quest for water. He enters a barber-shop at the end of that street, has his head shaved and nails pared, praying all the time. The hair and nail parings are buried in consecrated ground and the chief functions of the pilgrimage are over. All these forms may seem very silly to us, but they are all founded upon most ancient customs or are gone through to recall acts performed by Hagar, or Abraham, or some historic character; not one whit more senseless in foundation than the beautiful ceremonies of the Catholic Church, whose significance we know and admire.

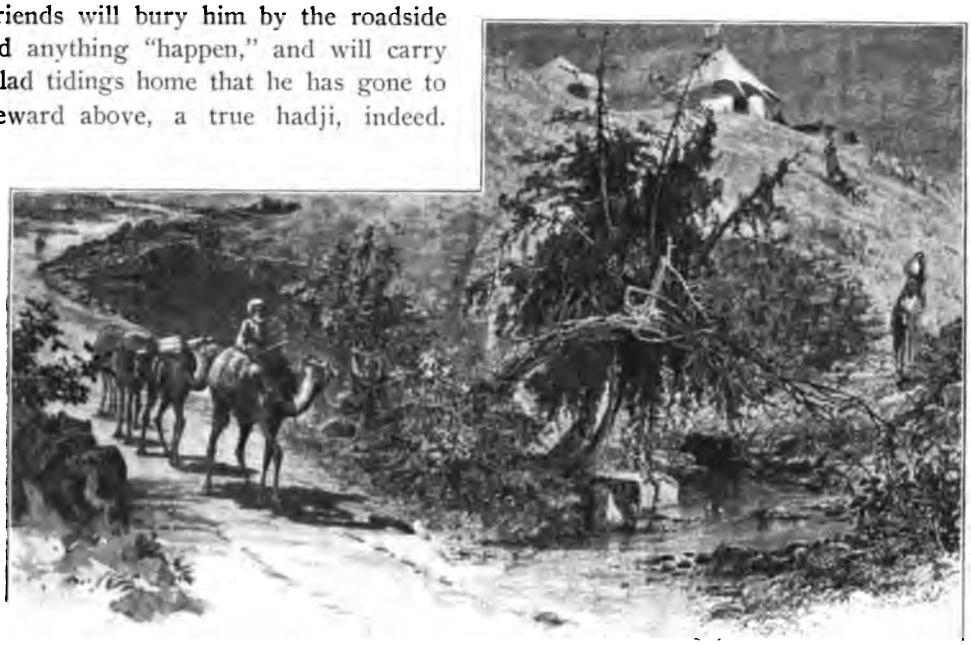
This brings our pilgrim to the 29th of March, the feast of Kurban Bairam. A great multitude goes out to Muna, some six hours from Mecca—it's a noisy procession. There they throw seven tiny pebbles at each of the three columns, as Abraham did of old, to drive away the devil. More prayers, and then the sacrifice of animals, all in commemoration of Abraham's sacrifice, and still more prayers.

Later on everyone bathes in the pool of Zobaida, in the valley below Muna, through which passes the greater part of Mecca's water supply!

The pilgrims return to Mecca, again visit the Kaaba prayerfully, and take a last look at that sacred structure to impress it indelibly upon their minds, and then prepare for their return home, their duty fervently and well done. And no one can throw more fervor, one might call it frenzy, even, into his religious observances than can your real pilgrim, the hadji. His memory will not be sorely taxed with details about the Kaaba. It is a tiny structure about 18 by 14 feet, some 40 feet high, and entirely covered with black cloth, a new drapery every year. It stands in a court of the Mosque, about 250 by 200 paces in extent, surrounded by a colmned cloister that is roofed with a series of little domes and has tall minarets to mark its corners. During the pilgrimage month the Mosque is generally pretty well cleared by 9 o'clock at night, but numbers of pious pilgrims pray there until very late, some even all night. The last night of the month of Ramadan crowds pass the whole night there, and it must be a weird sight. Burckhardt and a very few other gentiles have managed to see it at the great risk of their lives, had their disguise been imperfect. There are thousands of lamps hung all about and each pilgrim carries a little lantern. These are swung and flared about, as their holders grow more and more enthusiastic. Wild harangues are made; people exhort each other to louder piety. Why, no camp-meeting or caucus ever made half the noise or as brilliant a picture as does this night ceremony.

After the ceremonies no time is given your true hadji to rest. He must hurry home while all this eventful affair is fresh in his mind. He may be sick. No matter, his friends will bury him by the roadside should anything "happen," and will carry the glad tidings home that he has gone to his reward above, a true hadji, indeed. Mecca, to all intents and purposes, is a deserted city. You will find evidences galore of the recent invasion—a dead camel here, sacrificial blood pools there, the remains of a camp yonder. All passive signs, however, save to one's olfactive sense.

The people, the citizens? Why, they are not in evidence, not even to that aforementioned sense. You will have to seek them indoors, asleep or lazily counting over the dinars and dirherns they've made off the visiting faithful, for these coins are well greased and soon slip away as did the pilgrims. Besides, has the Lord not said to his prophet: ". . . Let not prosperity in the land deceive thee. 'Tis but a brief enjoyment!"



NEAR MOUNT ARAFAT.

EXTRACTS FROM THE BUILDING CODE NOW IN FORCE IN THE CITY OF CLEVELAND

(Continued from December.)

TITLE XVI.—FIREPROOF BUILDINGS.

All subjects under this title relate principally to the interior construction of fireproof buildings or buildings of the I., II. and III. classes, as defined under Title II.

SECTION I.—MATERIALS PROHIBITED.

No plaster of paris, or sulphate of lime, and no coal, sawdust, coke, coke breese, or unconsumed or partly consumed material, inclusive of cinders, containing any of the compounds of carbon and subject to combustion, disintegration or distillation at 1,500 degrees Fahrenheit, shall enter into any material used for the construction of the floors, partitions, covering for structural members, or in any part of fireproof buildings of the I. and II. classes, except in the form of wall plastering, or as a gauge for mortar. No quicklime shall be used in the composition of the material used in the construction of walls or floors except in combination with Portland cement when used for mortar in setting fireproof material with a trowel. See also section 4, Title X.

SECTION 2.—MATERIALS PERMISSIBLE.

In buildings of classes I. and II., only brick, porous or semi-porous terra cotta shall be used for floor and roof construction and for column and girder or other metal covering as prescribed in Title XV.

"Arched" concrete and "Lintel' and "Slab" concrete in short spans (see Titles X. and XV.) shall also be permissible in buildings of these classes; provided that no encasing material of any metal structural member is less than two (2) inches, as prescribed in sections 9 and 11, Title XV.

SECTION 3.—BUILDINGS OF THE I. CLASS.

No wood or other combustible material shall be used in any of the partitions, furring, ceiling, or in any part of a building of the I. class; all floor surfaces shall be of stone, cement, rock, asphalt, tiling, or similar incombustible material. All outside and inside window frames and sash shall be of metal or of wood covered with metal. Wired glass shall be used for all interior or exterior glazing except in fronts facing streets or other open spaces more than thirty (30) feet in width, or prism glass 4x4 inches may be used in all inside vertical openings and the upper half of all exterior windows. The decorations and trim shall be entirely of incombustible material.

SECTION 4.—BUILDINGS OF THE II. CLASS.

Buildings of the II. class, as defined under section I., Title II., shall have no wood or other combustible material in the finish of the ceilings of any part of the building or skylights, or any penthouse or bulkhead upon the roof, and wired glass need not be required except in inside hall doors and partitions.

SECTION 5.—COLUMN COVERING.

In the case of buildings of the I. class, the coverings for columns shall be, if of brick, not less than eight (8) inches thick in the basement and four (4) inches above the first floor of beams; if of hollow semi-porous terra cotta these coverings shall be in two (2) consecutive layers, each not less than two (2) inches thick.

If fireproof covering is made of porous terra cotta it shall consist of at least two (2) layers not less than two (2) inches thick each, if hollow, and not less than one and one-quarter (1¼) inches thick each if solid. Whether porous or semi-porous terra cotta is used, the two (2) consecutive layers shall be so applied that neither the vertical nor horizontal joints in the same shall be opposite each other, and each course shall be so anchored and bonded within itself as to form an independent and stable structure; but nothing in this section shall be so construed as to prohibit the use of two (2) inches of concrete or hollow dense tile for the first layer; provided, that the outer layer is of porous or semi-porous terra cotta as above prescribed.

In all cases there shall be on the outside of the tiles a covering of plastering with any cement "which is established as a standard cement," or of other mortar of equal hardness and efficiency when set. See Title XIV.

SECTION 6.—PROTECTIVE SHEATHING.

In places where there is trucking or wheeling or other handling of packages of any kind, the lower five (5) feet of the fireproofing of such pillars shall be encased in a protective covering either of sheet iron or oak plank, which covering shall be kept continually in good repair.

SECTION 7—SINGLE THICK COVERING.

In buildings belonging to Classes II. and III. the fireproof coverings for internal columns shall be made the same as specified for buildings of Class I., excepting that only one (1) covering of terra cotta and not less than four (4) inches, if covering is of brick, may be used. In buildings of the III. class the dense tile or concrete coverings shall not be less than two (2) inches thick.

SECTION 8—BEAMS AND GIRDERS.

The fireproof covering of iron or steel beams and girders in buildings of Classes I., II. and III. shall be effected with either of the materials before specified. If hollow tiles are used the tiles shall be set close to the metal to be protected, and there shall be an air space within the tile of at least three-quarters (¾) of an inch. If porous terra cotta is used it shall be at least two (2) inches thick if hollow, and at least one and one-quarter. (1¼) inches thick if solid.

Where concrete fireproof construction is permissible the covering for columns, beams and girders shall never be less than two (2) inches in thickness, irrespective of the plastering.

SECTION 9—EXTERIOR BEAMS AND GIRDERS.

The exposed sides of the iron or steel girders in the enclosing walls of buildings of the II. and III. classes shall be covered in with incombustible material not less than four (4) inches in thickness on the outer surfaces and tied and bonded to the column coverings, but the extreme outer edge of the flanges of beams, plates, or angles connected to the beams may project to within one and three-quarters (1¾) inches of the outside surface of the brick casing. The inside surfaces of girders may be similarly covered with incombustible material, or if projecting inside of the wall they shall be protected by terra cotta, concrete, or other fireproof material.

SECTION 10—BUILDINGS OF THE III. CLASS.

For the purpose of this code all buildings in which "dense" tile is used for fireproof construction and coverings, as defined in this and the previous title, shall be classed as buildings of the III. class, and shall be subject to all the rules and regulations of this class.

SECTION 11—CONCRETE PROTECTION.

When concrete construction as defined in Section 10 (b) and (c) of Title X. is used, in whole or in part, in the floor, roof, and fireproof construction, all concrete shall extend at least one (1) inch below the reinforcing members, and in all cases the exposed steel structural members shall be protected the same thickness as required for buildings of the I. and II. classes. Floors, windows, doors and inside finish may be of wood, except ceilings and skylights shall be the same as prescribed in section 4.

SECTION 12—PARTITIONS, ETC.

No constructive woodwork or other inflammable materials shall be used in any of the partitions of fireproof buildings, excepting that in buildings of the II. and III. classes and their frames, the trims, the casings, the interior finish when filled solid at the back with fireproof material, and the floor boards and sleepers, not less than one and three-quarters (1¾) inches spaced sixteen (16) inches on centers directly thereunder, may be of wood, but the space between the sleepers shall be solidly filled with fireproof materials, and extend up to the under side of the floor boards. See also Sec. 7, Title XV.

SECTION 13—HALL AND PERMANENT PARTITIONS.

All hall partitions or permanent partitions between rooms in fireproof buildings shall be built of fireproof and waterproof material and shall not be started on wood sills, nor on wood floor boards, but be built upon the fireproof constructin of the floor and extend to the fireproof beam filling above. The tops of all doors and window openings in such partitions shall be at least twelve (12) inches below the ceiling line.

SECTION 14—CHANGE OF CLASSIFICATION.

If any building of the II. or III class shall have dead walls along party lines, and have its public hall and corridor floors and glazing in partitions finished as prescribed for buildings of the I. class, and all exterior window openings on courts or courtways adjoining other buildings not less than thirty (30) feet distant, or any court of its own not less than twenty (20) feet wide, made of metal and wire glass, and the column covering is doubled as in buildings of the I. class, such building may be carried up to the height prescribed for the next class above.

SECTION 15—TRUSSED CONCRETE BUILDINGS.

When a building of the III. class is to be constructed with "trussed" concrete floor system in any story (see Secs. 19 and 21, Title X.), its area, height and number of stories shall not exceed the limits established for V. class buildings, and if such building is to be constructed with a "trussed" concrete frame (see Secs. 20 and 21, Title X.), its area, height and number of stories shall not exceed the limits of a VI. class building as established in this code.

SECTION 16—PARTIALLY FIREPROOF.

When a fireproof building has but one (1) inch of fireproof covering on the bottom flanges of its beams and girders or less than two (2) inches for its column coverings, it shall be deemed a building of the IV. class, and if such buildings have no fireproof protection on the columns or metal beams it shall be deemed a building of the VI. class, and each shall be subject to the rules and regulations of their respective changed classification.

SECTION 17—COMPOSITE BUILDINGS.

In cases where a better class of construction is used in the lower part of any building, the height and area of such building shall be limited according to the classification of the uppermost story or roof.

SECTION 18—WORKSHOPS AND SHEDS.

Large work and machine shops or one (1) story sheds in which incombustible material is worked or stored, whether the structural metallic parts are protected or not, may be considered buildings of the II. class. If such building has a "mill" constucted mezzanine floor and "mill" constructed roof on metal girder and truss work, it shall be considered a building of the III. class.

SECTION 19—FIREPROOF DUCTS FOR PIPES.

In buildings under this title, all pipes, conduits, mains, wiring and conveyances for conducting heat, light, power and water, when enclosed, shall be encased in separate fireproof ducts and shall not be enclosed in the fireproofing surrounding any column, girder or beam of steel or iron, except as modified in Section 12 of Title XII., in which case all piping shall be fastened rigidly, with due allowance for expansion, at a sufficient number of points to the columns between each floor to prevent buckling of pipes and consequent destruction of fireproofing in the event of fire.

WIREGLASS WINDOWS IN METAL SASH AND FRAMES SAVE VALUABLE BUILDING—A SUCCESSFUL FIRE TEST UNDER ACTUAL CONDITIONS

(From Insurance Engineering, December.)

Five years ago the windows of a large modern building in Chicago, occupied by a mail-order department store, were protected with wireglass ("Mississippi") in metal frames ("Miller"), were exposed to any fire that might occur in another large building of inferior construction, located across an alley. The test of the value of that form of protection against an "exposure" fire, under actual conditions, came last month.

The fire occurred on the night of November 12 and caused a property loss of about $175,000.

The Skinner building, which was practically destroyed, was five stories in height, of brick and stone construction, with joisted floors supported on unprotected cast-iron columns. The ceilings were full of concealed spaces and the stairways were open.

A clothing firm occupied the first and second floors, feather goods manufacturers the third and fourth, and the fifth floor was occupied by furniture manufacturers. The highly combustible nature of the contents of the building undoubtedly influenced the extent of the loss.

Regarding the efficiency of the wireglass windows, an officer of Montgomery Ward & Company says: "These windows are in many instances cracked by the fire and water, but in every case the lights held their positions, entirely excluding the flames. The comparison between their performance and the complete failure of the metal shutters on the Skinner building was very instructive. Nothing short of extraordinary efficiency on the part of the wireglass windows, combined with the well-directed efforts of the city fire department, prevented the fire from developing into a large conflagration."

CONCRETE STEEL CONSTRUCTION

Second Article

BY WILLIAM COPELAND FURBER.

(From the Brickbuilder.)

The first part of this paper dealt mainly with the structural side of concrete steel construction. In this part, the economy—in the sense of first cost—will be considered. There is but little doubt that concrete steel construction, from a fireproofing standpoint, is far superior to mill construction, and we ordinarily find it, if for no other reason than that of eliminating so much combustible matter from the building. If we cannot afford standard fireproof construction let us by all means use concrete steel if it is properly designed and designed so as to avoid the extremes in girders and beam construction which we sometimes see; but it is not yet altogether clear that the most economical floor system, all things considered, is not the standard I-beam and hollow-tile construction. The items that make up the cost of the two systems may be briefly considered.

In both systems steel is used exclusively to take tension in all members, it not being considered good design by even the most advanced advocates to consider concrete as having any tensile value. In concrete steel the metal is frequently of special design, requiring special forms to roll it and therefore demanding a special price, which exceeds the price of ordinary rolled forms. In concete steel the compressive stresses are taken by the concrete, while in I-beam construction these stresses are taken by the metal. If the amount of metal in both systems be considered equal for tension requirements, it is evident that the I-beam construction requires more metal for compression requirements than the concrete, which requires none.

In the matter of centering, the terra cotta floor arch does not require as careful or accurate false work as the concrete construction nor quite as much of it, nor does it require to be left in position as long; therefore less centering will be needed. The centering for terra cotta constuction, being suspended from the floor beams, is of course much cheaper to erect than the centering for the concrete construction, which requires posts carried up from the floor below to support the floor in the process of construction. If the centering for concrete work costs five cents per square foot, the cost of the terra cotta centering should not exceed two and a half cents to three cents per square foot.

In the cost of the material composing the floor a slight advantage is with the concrete if cement is low in price and the rock or filling material is to be had near at hand. If concrete be taken at $78 per cubic yard and the average thickness of the floor be taken at five inches, then in a square foot of floor the cost of the concrete filling will be ten and eight-tenths cents per square foot. If to these figures the cost of centering be added, the figure will be fifteen and eight-tenths, without the cost of the steel reinforcements. The cost of the reinforcement will be from two to four and a half cents per square foot, which will make the cost of the rough subordinate floor system stand at seventeen and eight-tenths to twenty and three-tenths cents per square foot.

The cost of terra cotta arches erected will vary from eighteen cents for an eight-inch arch to twenty-three cents for a twelve-inch arch. It is evident then that in the floor construction, exclusive of the beams and girders, the cost of the two systems varies but little.

The cinder concrete filling in both systems, with the sleepers embedded in it, costs about two to three cents per square foot, which, added to both, makes them stand at, say, twenty to twenty-six cents per square foot, the wood covering, if of good maple, added say four to four and one-half cents more, and the figures stand at, say, twenty-four and one-half to thirty and one-half cents per square foot. The sleepers of a section, say three-inch by three-inch square, will add about three cents per square foot.

There is not, therefore, a great deal of difference in cost between the two systems exclusive of the main lines of support, and these differences might be reversed under certain local conditions. When the girders and beams in the two systems are contrasted, the I-beam construction, as has been shown, requires metal in the compression flange, and this costs more than the concrete.

The enterprise and vigor which characterize the concrete advocates is worthy of the emulation of the standard hollow-tile manufacturers. The Baltimore conflagration brought to light in a general way the often inferior details of the hollow tile and the worse than careless manner of its application. Concrete has the quality of cohesiveness, and in this respect the hollow tile as usually applied often leaves very much to be desired.

Long ago, before the Baltimore fire, the weak points of the present details of hollow-tile construction were pointed out in these columns, and certain recommendations for increased thickness of material were made. The recommendations were afterwards incorporated in the revised building laws of Philadelphia. In the recent report of the National Fire Protective Association similar recommendations for the increased thickness of terra cotta coverings are given a prominent place.

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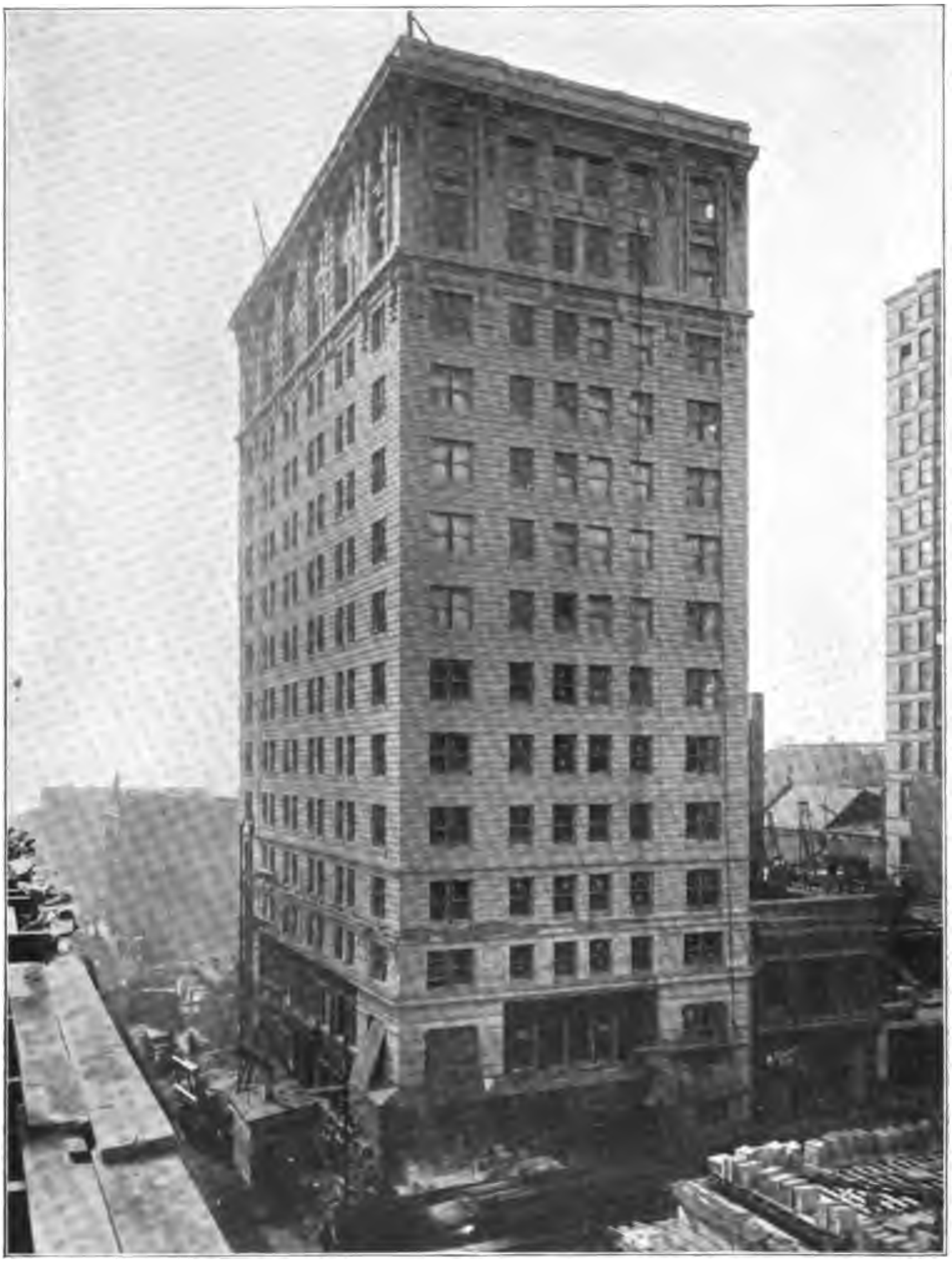

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THE PRESIDENT AND THE ARCHITECTS

At the thirty-eighth annual convention of the American Institute of Architects held at Washington on the 11th, 12th and 13th of January, the most important event was the banquet at the Arlington, at which President Roosevelt was a guest of the Institute. Not only was Mr. Roosevelt present, but Mrs. Roosevelt and ten other ladies, who had been invited by her as her escort. There were present one hundred and fifty architects and nearly one hundred guests, among whom were members of the cabinet, ambassadors, senators, congressmen, the highest officers of the army and navy, presidents of universities and societies of artists from various parts of the country, men prominent in literature and journalism and "captains of industry." The President did not respond to any toast. Mr. W. S. Eames of St. Louis, president of the Institute, who presided, only announced "The President of the United States." The address was characterized by that positive manner and forcible utterance to which all who have heard him on similar occasions are accustomed. The following is a verbatim report:

PRESIDENT ROOSEVELT'S ADDRESS.

It is a great pleasure to have the chance of coming here this evening and saying a word of greeting to a body of men who are engaged in doing work for this republic which is to count, not merely in the present generation, but during the lifetimes of many generations to come. We hear a great deal said about true Americanism. Now the real American, the American whom it is worth while to call such, is the man whose belief in and work for America are not merely for the America of to-day, but for the America of the future.

It is comparatively an easy thing to do work when the reward is to come in the present; but every great nation that has ever existed on this globe has been great because its sons had in them the capacity to work for the well-being of the generations yet unborn. Such a spirit is peculiarly necessary when the work that we desire to have done is essentially work of a non-remunerative type, non-remunerative in more than one way: non-remunerative in money, and it may be in fame. We do not know the names of the architects and builders of the great cathedrals whose magnificent bodies are an heirloom to civilization. We do not know the names of the builders of the great majority of the work to which every man with any aspirations after beauty naturally turns when he thinks of the past. We owe that beauty, we owe the elevation of thought, of mind, and soul, that comes with association and belief in it to the fact that there were sufficient number of men who worked in the spirit that Ruskin prayed in—the spirit of doing work, not for the sake of the fame, but for the sake of the work itself.

There are things in a nation's life more important than beauty; but beauty is very important. And in this nation of ours, while there is very much in which we have succeeded marvelously, I do not think that if we look dispassionately we will say that beauty has been exactly the strong point. It rests largely with gatherings such as this, with the note that is set by such men as those I am addressing to-night to determine whether or not this shall be true of the future.

A very large percentage of the durable work, the work which is lasting, must be done by the government. Great buildings and beautiful buildings will be erected by private subscriptions, but many of the grandest buildings must necessarily be erected by the government, national, state, or municipal.

Those in control of any branch of that government necessarily have but an ephemeral lease of power. Administration succeeds administration; Congress succeeds Congress; legislature succeeds legislature, and even if all of the administrations, all of the congresses, are actuated (a not necessarily probable supposition) by an artistic spirit, it would still remain true that there could not be a coherence of their work if they had to rely on themselves alone. The best thing that any administration, that any executive department of the government can do—and if I may venture to make any suggestion to a co-ordinate branch, Senator Cockrell—I would say that the best thing that any elective legislative body could do is in these matters to surrender itself, within reasonable limits, to the guidance of those who really do know what they are talking about.

The only way in which we can hope to have worthy artistic work done for the nation or for a state, or for a municipality, is by having such a growth of popular sentiment as will render it incumbent upon successive administrations, successive legislative bodies, to carry out steadily a plan chosen for them, worked out for them by such a body of men as that gathered here this evening. What I have said does not mean that we shall go here in Washington, for instance, into immediate and extravagant expenditures on public buildings. All that it means is that whenever hereafter a public building is provided for and erected, it should be erected in accordance with a carefully thought-out plan, adopted long before, and that it should be not only beautiful in itself, but fitting in its relations to the whole scheme of the public buildings, the parks, the drives of the District.

Working through municipal commissions, very great progress has already been made in rendering more beautiful our cities from New York to San Francisco. An incredible amount remains to be done. But a beginning has been made. And now I most earnestly hope that in the national capital a better beginning will be made than anywhere else, and that can be made only by utilizing to the fullest degree the thought and the disinterested effort of the architects, the artists, the men of art, who stand foremost in their professions here in the United States, and who ask no other reward save the reward of feeling that they have done their full part to make as beautiful as it should be the Capital City of the great republic.

BE JUST TO THE DEAD

The American Architect and Building News is the oldest survivor of the earliest American journals devoted to the interests of architecture and architects. There was a time when, in its illustrations, it was the leading expositor of what was called "the Gothic revival."

In a recent obituary on the late Edward Tuckerman Potter, who it says, "made his mark on the face of things during the time of the Gothic revival and the period of Victorian Gothic," it takes occasion to say, "One always feels strangely pitiful towards those unfortunates who tried to give architectural expression to Ruskin's poetical recommendations while fettering their ideas and feelings with the profoundest study of Gothic moldings." If there are any survivors of "those unfortunates" they are not in need of the pity of anyone in the present generation, much less of the *American Architect,* as its policy is now directed. Nor was the late Mr. Potter entitled to the pity of anyone or in any sense unfortunate. In all his life he was an exemplar of "sweetness and light," and a living protest against American philistinism. He retired from architectural practice long before architecture came under the domination of modern fashions and the influence of the French School of Fine Arts in this country. In his time many architects were seekers for light. There were a few among them who realized that the architects of that day had *no settled purpose in their work.* At a period when the Greek classicism of the first half of the century had failed to demonstrate that it was a cult adapted to modern needs and requirements, architects were experimenting with all sorts of styles revived from the past, each borrowing from whatever suited himself. The so-called "Gothic revival" in England was originally the work of Anglican priests, who called architects to their aid. Hence resulted what has been called the Oxford movement. It was a revival of church architecture. Simultaneously Ruskin was writing about and illustrating the romantic architecture of the fourteenth century which he found in Italy, and it was much later that he discovered the beauty of form and details in the cathedrals of France. These investigations were followed by those of Viollet-le-Duc. They attracted the attention of a few American architects who had time to think about what they were doing. Mr. Potter was probably the first of them to give his ideas expression. The little church at Schenectady is where they can be seen. He was tired of the shriveled oak leaves which had thus far been considered the essentials for carving in Gothic churches (designed in poor imitation of the fourteenth century parish churches of England, which had been illustrated in books), and he introduced carvings in the nave capitals of his church following the lines of natural foliage, the conventionalization of which was worked out by his stone carvers. This was the beginning.

And there were others in this country, but not many, who did similar things. They profited by the plea for rationalism by Viollet-le-Duc, and the plea for beauty by Ruskin, and found their models for construction, not only in its highest development as seen in the buildings of western Europe at the beginning of the thirteenth century, but in the Greek buildings of the fourth century, B. C. They were all of them successful practitioners.

But they had imitators who saw only the surface treatment in their designs and tried to copy them. They were many, and through their ignorance they made the movement ridiculous in the eyes of the general public who did not know how to discriminate.

Something better might have followed had these ideas had time to develop a concrete expression through continued evolution, and had such men as H. H. Richardson and John W. Root lived a few years longer. Such, in brief, is the story of the so-called "Gothic revival" so far as this country is concerned. The earnest men who took part in it had no desire to revive Gothic architecture, but were seeking only for a truthful expression of modern needs in architecture. Evolution would soon have carried them away from all old designs, and the "study of Gothic moldings," which is all that the *American Architect* can now see in the movement.

Within the last fifteen years, French fashions have had their sway. What the future may bring forth it is impossible to say. English architects are working over old Jacobian ideas, while the Belgians, Dutch, French, North Germans and Austrians are experimenting with the "new art."

What might be called "independent design" to distinguish what really has no name, is growing in the middle Western states, and is now being practiced by seriously minded architects to a certain extent. It may result in another evolution from the principles of rationalism. Who can tell?

THE BUILDERS JOURNAL (LONDON) FIRE SUPPLEMENT

That the *Builders' Journal and Architectural Record* should have recently added to its pages a monthly fire supplement is evidence of the increasing interest in fire prevention in England. This is acknowledged to be due not only to the agitation carried on during the last few years by the British Fire Prevention Committee, but to the example set by the publication of FIREPROOF MAGAZINE in this country. It is also gratifying to learn that the consulting editor of this supplement is the well-known architect, Edwin O. Sachs, chairman of the British Fire Prevention Committee.

In introducing the supplement to the public, the editor makes this candid announcement:

"When a journal essays some new departure it is a general rule for the editor to attribute this to a desire to fulfil some existing demand. We, however, in arranging this new supplement to The Builders' Journal do not wish it in any way to appear as if we thought these extra pages were fulfilling an existing demand. Quite the reverse. We do not believe that there is any demand among architects, surveyors and builders as a whole for information regarding fire protection. The few architects, surveyors and builders interested in the subject are still very much the exception. Owing to that quaint conservatism which has long distinguished both the professional man and the typical contractor of the metropolis, there has been a very curious apathy in respect to the fire question, except in a few individual instances, and except, perhaps, spasmodically for a short period after some great catastrophe.

"The object of this supplement is thus not to fulfil a demand, but to create a demand for regular information on the subject of fire protection, and to assist in stimulating the interest due to the subject, but which has hitherto not been accorded it, so that in time the facts we present may actually be looked upon as an absolute necessity for any intelligent architect, surveyor or contractor.

"We wish to stimulate interest in everything appertaining to fire protection which concerns the building world directly or indirectly, because we are convinced that the great technical problem of the next few decades is to erect buildings with due regard to fire resistance, and to equip them with the view of preventing fires and also to extinguish these rapidly when they occur."

We think that this statement is more conservative than the conditions warrant; but conservatism is what we always expect to find in England. We believe that the interest in these matters is growing in that country as it has in our own for many years past. It is interesting to note that much of the matter in the Journal is drawn from American experiences.

ONE YEAR AFTER THE BALTIMORE CONFLAGRATION

BY THE EDITOR.

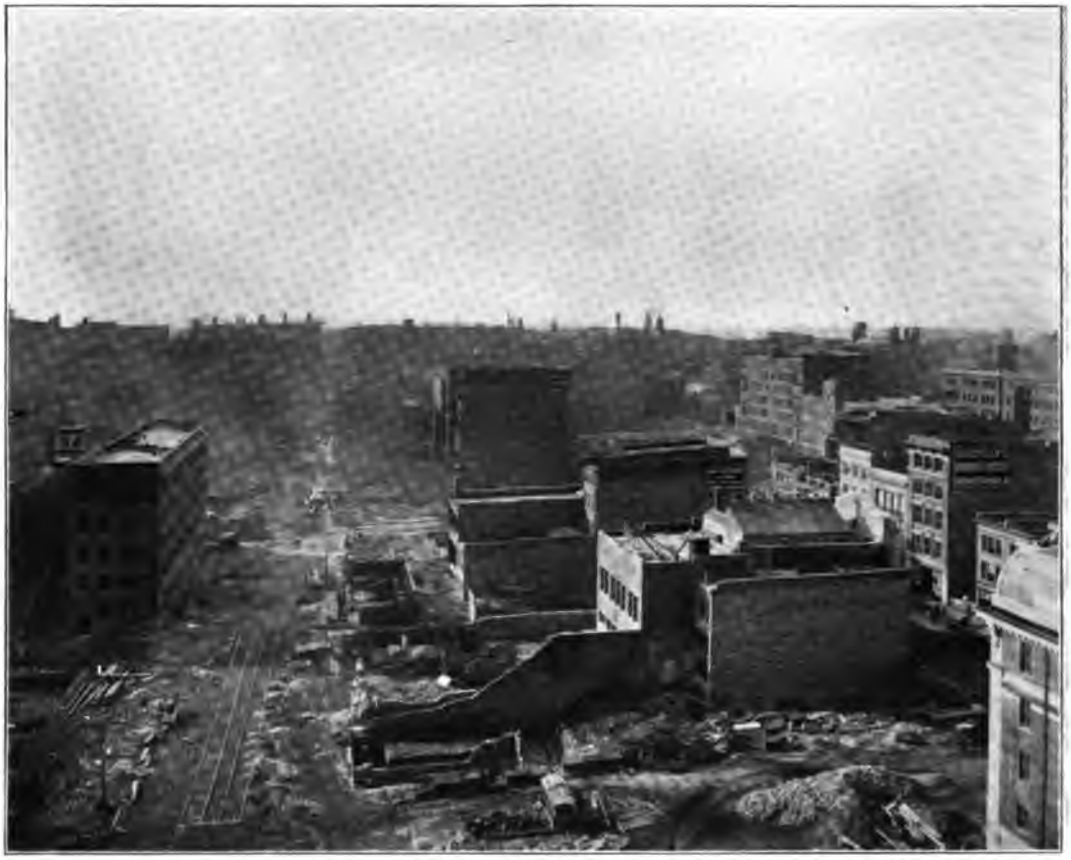
THE present month is the first anniversary of the great conflagration at Baltimore, and with a deep desire to learn what that city had thus far done to efface the scar and rise from the great misfortune we have just looked over the ground.

It must be admitted that the present results are disappointing. Fully twenty-five per cent of the ruins are still untouched and it is fair to say that improvements have been commenced on less than half of the ground. It has been claimed that this delay is largely attributable to two causes, the slow process used in deciding what changes to make in the much needed widening and alignment of streets and the failure of the authorities to improve the building laws, as was expected and promised. As far as concerns the former, we have only noticed the widening of Charles street and the cutting off of a corner where diagonal streets converge. These improvements are supposed to give an impetus to building improvements in those localities, but there is little evidence of it.

The most noticeable thing now in the burned district is the great number of signs showing that property is for sale. It has been explained that the reason is that the majority of property owners are only making improvements as far as their realizations from insurance will go, and that those who did not realize enough to enable them to do so, have thrown their property on the market rather than invest any more on it. The natural result must be that land will fall in value. The great number of small and cheap buildings thus far erected will naturally increase the downward tendency in values. Much of the land burned over was cheaply improved originally and probably did not bring large rents. But the opening to view of the whole area from the financial district down to the water front suggested to outsiders who were competent to judge that there was a great apportunity for the property owners to make the land more valuable by the use of money and enterprise. It is generally believed that they had the former or the means of obtaining it, but it is very evident that they have given evidence of possessing the latter only in exceptional instances. Some of the property is said to be owned by small estates, but it is also said that a large part of it belongs to those who are too rich to care anything about it.

It looks as if one of the results would be that only the northern section near the great public buildings and the wholesale quarter will be able to maintain their values, and that valuable improvementts will hereafter be made north of the burned district where there are many worthless old buildings that will be gradually vacated as the rebuilding continues.

The results were very different at Chicago in 1872, even though less than half of the insurance money was realized. There the

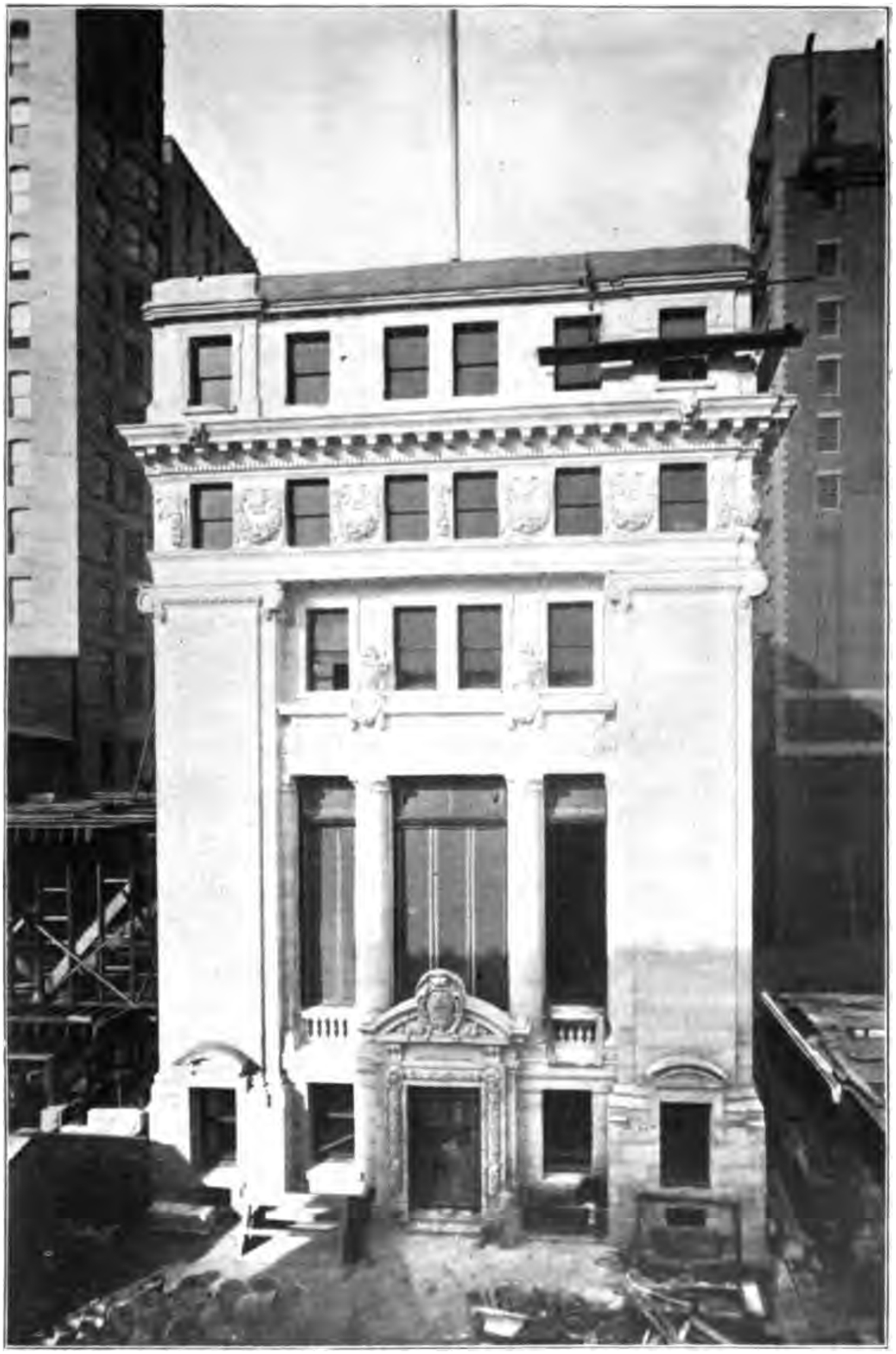


FROM A PHOTOGRAPH IN THE BURNED DISTRICT OF BALTIMORE
Taken January 21, 1905

land values actually increased during the year after the great fire because of the enterprise shown in rebuilding in an improved manner. The business center in Chicago never was changed by the fire. The only result was that wholesale business was consolidated in the one quarter instead of being scattered.

Another noticeable fact in Baltimore is that where any number of contiguous buildings have been erected, they are of all sizes and heights and the sky lines lean rather to the picturesque than to the beautiful. Here another opportunity has been lost. Many buildings on valuable land are too narrow to be of permanent value as investments.

These impressions have nothing to do with the other great lesson of the fire, which should have been so convincing as to lead to the erection of more fire-resisting structures. We saw several six-story buildings in which only "ordinary" construction was used, and large wholesale stores in which very heavy mill construction was used, but no attempt made to fireproof the cast-iron columns in the first story. Some idea of the slowness in rebuilding may be formed when we state that the wholesale store in which the fire originated, the largest in the city, and of heavy mill construction, has only reached the fourth story. Very few wholesale stores have been occupied thus far, but nearly all of the six skyscrapers whose structure was saved by fireproofing with clay products, are now ready for tenants. On only one of them was it found necessary to take down the exterior facing, and in all except the Equitable the floors were practically saved. The defective floor construc-



THE NEW BALTIMORE STOCK EXCHANGE FIREPROOFED WITH HOLLOW TILE
A. R. Whitney Jr. & Co., Contractors.

tion of the latter has been replaced by I-beams and flat hollow tile arches, the columns and girders not having been seriously affected, notwithstanding the faulty construction of the floors originally. The Calvert, which building's one weak spot on the eighth story certain persons have advertised so extensively for their own interests, has been the first to open its doors to tenants.

The well advertised concrete building, which these same persons also advertised, has disappeared.

Only one new "skyscraper" has been erected. It was built especially by the enterprising *Baltimore American* and has been completed during the year. This building, following the example of the six other buildings of this kind which were saved by hollow tile fireproofing, is fireproofed with the same material in the most effective manner.

It is not our purpose now to enlarge upon the subject of the repair of the Baltimore "skyscrapers." It is a very interesting matter and will be given in detail by our special contributors.

There are many buildings in course of erection at Baltimore in which concrete is used for construction in various ways. Some of them are of reinforced concrete throughout, including the exterior piers. In one the stairways are being built with the floors, and the exterior columns or piers used in the same manner as steel would be, are faced with stone on the two lower stories and brick above. They are built not with, but after the concrete. In several of these buildings only the first floor and the piers of the exterior walls are thus far built and the box forms for the columns are not removed. January has been a very cold month, the thermometer ranging sometimes as low as 20 degrees Fahrenheit, and concrete operations are generally suspended and the buildings considerably delayed. But the hollow tile people are working everywhere. On one building where the box form was still around the outside column and the concrete had been filled only four days, we saw a man with a garden hose playing water over the wooden forms. The thermometer was 24 degrees Fahrenheit on that day. In reply to an inquiry, he said the object was to get a skim of ice outside of the wooden box, because ice is a non-conductor and would keep the concrete from freezing.

If this is a sample of the troubles of concrete builders in winter, what may we expect in the spring when it begins to thaw? But we were assured that none of these concrete buildings were to be carried above ordinary heights; in fact, some of them now approaching completion are quite small.

Some of the new banks are being built only one and two stories high, profiting by the experience of those banks which the conflagration is said to have jumped over. The new Stock Exchange is of this character.

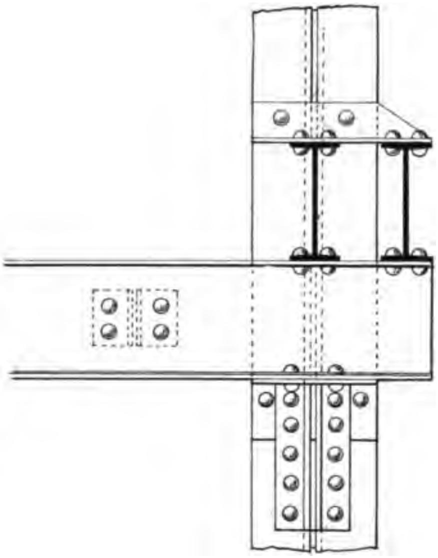
INTERIOR GIRDERS

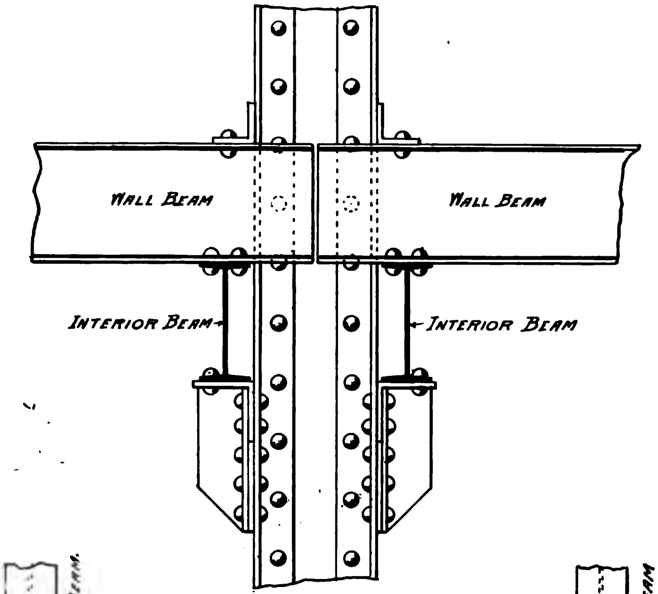
BY W. I. PARRY.

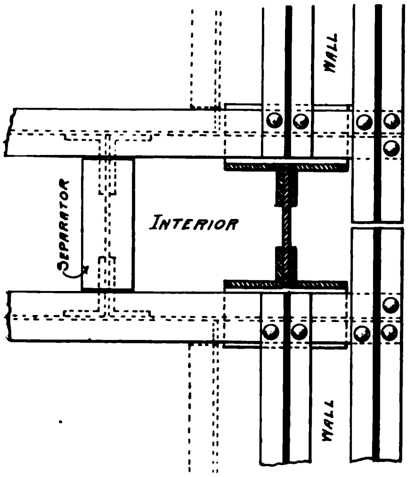
THE interior girders in an office building of the skeleton or cage type really play, or should play, a more important role than the mere carrying of the floor beams. Based upon the general assumption of the theory of wind bracing that the building is to be considered as a cantliever girder placed on end, it is evident that this bracing will require horizontal struts as well as the vertical struts or columns of the building. Whether these are considered as performing a duty similar to that of the posts in a truss, or simply as horizontal columns, the necessity of their consideration in relation to horizontal pressure from wind or other agencies seems evident. In their design, therefore, the strut consideration should not be forgotten.

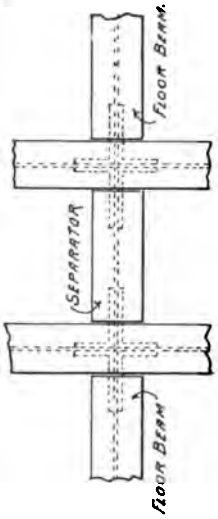
One way of producing the strut or column effect is the use of girders of as great a depth as the architectural requirements will permit. This may be brought about either by using deep beams or built-up girders. Another way is the development of the strut along column lines—that is, the use of a double beam or double channel construction. Where this type can be used an advantage can often be secured in maintaining the same depth of girder as that of the floor beam, thus eliminating all projections below the general ceiling line and admitting of a flush ceiling throughout. By this means is avoided the production of arbitrary lines to govern the location of partitions between rooms. It permits the interchangeability or subdivision of rooms with partition walls at any desired point, based, of course, upon the assumption that the floors would be designed, as they usually are, sufficiently strong to support these partitions at any point in the floor construction.

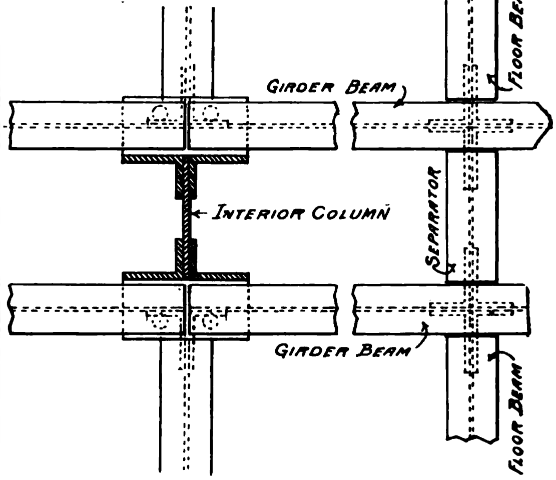
The objection to the use of the close double beam girder is the difficulty of handling the floor beams and girders in erection where these beams frame into the girder. It will be readily understood that the riveting or bolting of the connections for these beams to the girders is of necessity attended with considerable difficulty, which is also encountered in setting them in place. To overcome this it has of late been the practice of some structural engineers to separate the double beam or double channel sufficiently for the easy handling of connections for the floor beams in erection, using as separators short pieces of beams at the ordinary interval of three to five feet. In some cases this method has been used, abutting the ends, where possible, against columns or else against a side plate riveted to the face of the column. This is doubtless advantageous in some constructions. Another apparently practical arrangement has been used in several cases, notably in the St. Paul building in New York City, where the interior double beam girder has been separated sufficiently to premit the use of a beam or channel on each side of, or straddling, and extending beyond the column, the projecting ends to be utilized as a











bracket for the support of the outside wall or spandrel beam.

This construction has sometimes been used in high buildings with channels riveted to gusset plates, which are in turn fastened to the sides of the column. In this way the gusset plate type of wind bracing can be produced.

The accompanying sketch shows, in a general way, a method where beams are used without the gusset plate, producing the result explained above. This sketch is intended simply to illustrate the principle and the advantages gained in this construction.

As is well known, one of the theoretical difficulties to be contended with in steel design is the tendency to produce an eccentric loading of columns, particularly when wall columns are considered. By the method here shown the loads are brought to the column on each side and the beams rest on shelf angles. The tendency of the load transferred in this way is to produce a vertical resultant.

In the drawing shown it is assumed that the column, in all cases, would stand back from the outside wall line, which is likely to produce an interior pilaster effect. The building laws of some cities require the surface of the column to be nine inches from the face of all exterior walls. It will readily be seen that this construction is peculiarly adapted to this condition, and, taking into consideration the balancing tendency, its advantages in all cases seem apparent.

By the balancing tendency is meant the effect produced by the girder receiving the floor load on the interior side of the fulcrum point of the column, opposite the bearing point of the wall load, the bracket or shelf angles acting as the fulcrum upon which the girder beams rest on each side of the column.

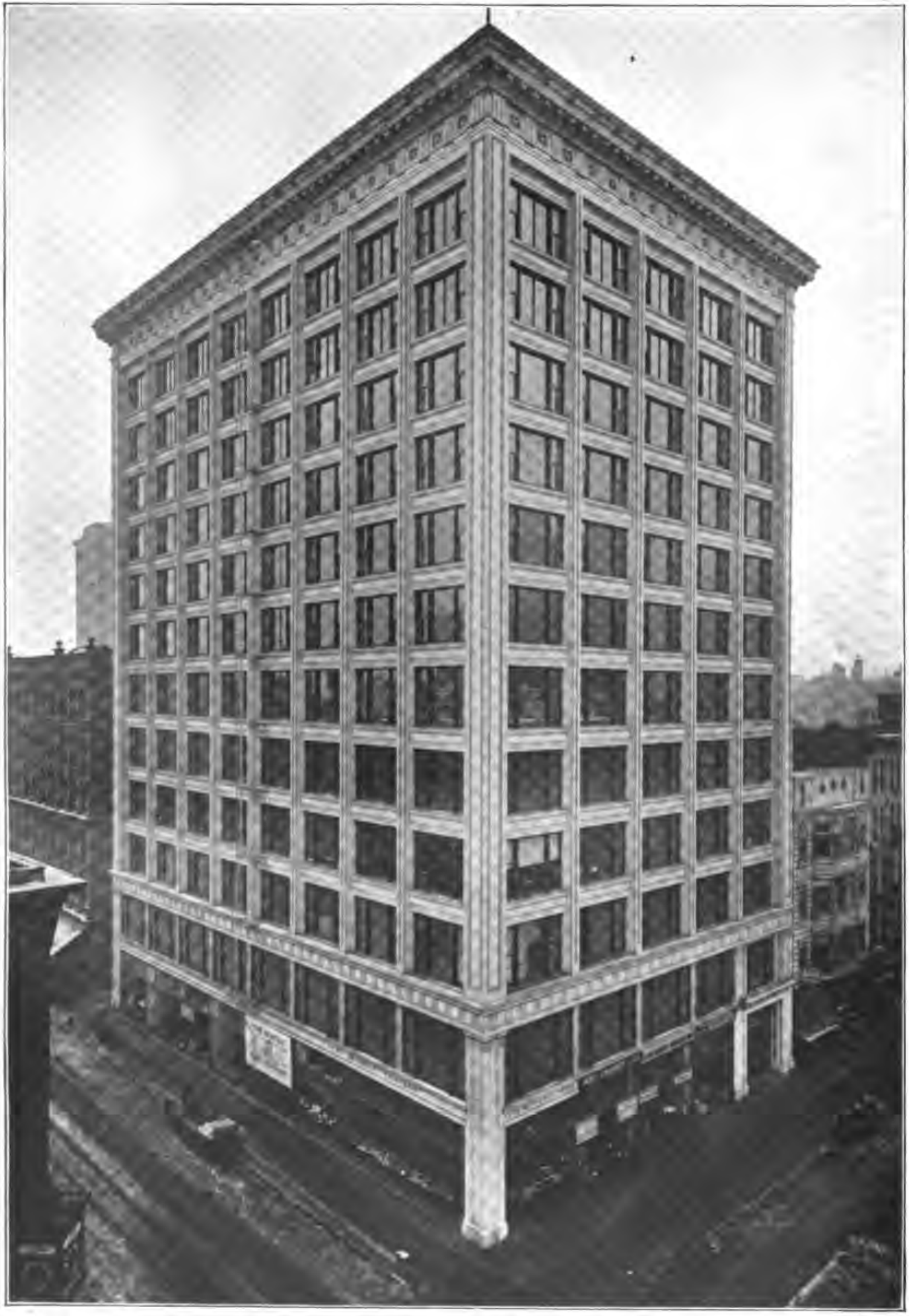
It will, of course, be understood that the drawing does not attempt to indicate sizes or to make positive the detailed design, but simply conveys, in a general way, the idea of the balanced beam strut construction. It might be expedient, for instance, under certain circumstances, to have the wall or spandrel beams frame into the interior girder, although this construction would likely produce difficulties in erection. The general design should, of course, be modified to suit the particular conditions presented.

The main advantages of this type of construction are: the strut effects secured by the double girder; the effective bracing of the column; the minimizing of the tendency to eccentric loading. The dotted lines indicate the wall channel framing into the interior girder to receive the arches. As already explained, this might be used or other arrangements might be made according to the particular conditions governing.

It will readily be seen from the sketch that where gusset plates are necessary for bracing they could be introduced on the sides of the column and riveted to the flanges of the I-beams by angles, or where channels are used the plates would extend along the sides of the columns riveted to the webs of the channels.

This construction is, of course, simply offered as a suggestion for use in cases where it could be applied to advantage. It is not set forth as the "only way," which remark applies to all constructions. In other words, the particular existing conditions must govern in all cases.

One point which perhaps has not been explained is that the interval between the interior beam girders in the flooring system can be readily filled up with terra cotta arching or concrete, the same as any other floor space between beams.



THE REPUBLIC STORE, BANK AND OFFICE BUILDING, CHICAGO.
Exterior of White Enameled Terra Cotta and Fireproofed Throughout With Porous Terra Cotta
Holabird & Roche, Architects.

ARCHITECTURAL ENGINEERING AND THE RELATIONS BETWEEN ENGINEERS AND ARCHITECTS

COMMENTS ON A PAPER READ BY CORYDON T. PURDY, MEMBER A. S. E., AT THE THIRTY-EIGHTH ANNUAL CONVENTION OF THE AMERICAN INSTITUTE OF ARCHITECTS, HELD AT WASHINGTON, D. C., JANUARY 12, 1905.

ONE of the most important and instructive papers read before the recent convention of the American Institute of Architects was that presented by Mr. Purdy. All of those who are acquainted with the valuable work done by him in connection with architects during the past fifteen years will know that he speaks from experience and with authority.

Mr. Purdy commenced with a brief statement of the part that rolled steel has taken in the development of modern architectural construction since its introduction about twenty years ago. Referring to what had been done in the line of architectural engineering in past ages with such skill and precision, he paid the following just tribute to the architects or constructors, or whatever they may be called, of the Middle Ages: "Many of the great designers of the Middle Ages must also have been great engineers. Their command of geometric functions may have been as great as ours. From a structural standpoint, their work will always remain notable—some of it remarkable—and the new era does not signify that we know more than they did, but that we now have a material for our buildings that admits of forms of construction of which those masters could not have dreamed."

He then told of the evolution of the steel frame in building construction, and the first appearance in the field of the structural engineer; how exact calculation of stresses began to supersede the results of experience and precedent. Of this he said in conclusion: "We lean on our computations, and not on precedent. Judgment is not eliminated, but in a large measure it is transferred, and the experience required is the experience of the technical man rather than that of the observer."

> To put it briefly, structural and mechanical problems in building work were comparatively few in number in all times preceding the advent of rolled beams, while accurate and definite methods of treating such problems, particularly those involving the strength of materials, were at least relatively crude and unsatisfactory and electrical problems were entirely unknown. In these days, such problems fairly burden every design, and they are susceptible of definite calculation and accurate determination. Unless we get this point of view, we shall scarcely be able to appreciate what an evolution is really going on at the present time in the relation of the architect to his work and in the operations of his office, or to realize that these changing processes are not yet completed.

Then followed a description of the proper functions of the engineering profession compared with that of the architect. Mr. Purdy contended that the former was "quite a new thing." But we presume that he had mainly in mind his own recent work. He even claimed that, "compared with that of the architect, it is really in its infancy." In the former statement he must have forgotten, for the moment, the great works of the latter part of the eighteenth and the first part of the nineteenth century, and the achievements of such men as Brunel and Stephenson, but further on his statements showed he had in mind the struggles and trials of his profession during the last half-century, and its want of cohesive action to guide its collective demand for recognition as a learned profession. Comparing it to that of the architect, he evidently had in mind the great works of antiquity, including those of remote ages of which even to-day we have no adequate explanation showing the method of employing constructive expedients. He deplored the fact that many engineers of eminence are still compelled to work for yearly salaries. But if comparison were made between the salaries paid to engineers and those sometimes paid to architects, on important works, the former would appear princely as compared with the latter. Still it remains a fact that architects in practice are seldom so employed, while engineers on salary are many, and the nature of the varied work required by great corporations seems to make it necessary.

He told of his own experience in moving his office from Chicago to New York, where he found the architectural engineering for buildings mostly in the hands of the iron constructors who had the contracts, and always with the consent of the architects, a practice that has now nearly disappeared.

Referring to the proper work of the structural engineer, and its possible variations, we quote the following from the paper:

The structural engineer ordinarily includes in his part of the work the structural framework of the building, be it much or little, the foundations, and also the masonry whenever it becomes complicated or questions of strength are involved. This part of the designing of a building can be accomplished in several different ways:

1. The architect may do the work himself, without assistance.
2. The architect may have the work done by some manufacturer.
3. The architect may have the work done by the builder, or the owner, with his consent, may have it done in that way.
4. The architect may employ the engineer as a part of his own office force.
5. The architect may associate the engineer with himself as a partner.
6. The architect may employ a consulting engineer who has his own independent office and practice.
7. The architect may be associated with such an engineer, employed directly by the owner, without any personal arrangement with him in relation to the matter; or
8. The engineer may have control of all the work, with the architect more or less subordinated to him.

All of these methods of getting the work done are in vogue at the present time. It is a wide divergence of practice and certainly a very undesirable condition of affairs. With engineers in other departments, particularly in electrical work and heating and ventilating, the practice is more uniform, but not sufficiently so.

The responsibility rests chiefly with the architect. Where the work has been done by men in the employ of the manufacturer or the builder, in many cases it has been so because they wanted it, and when they have been employed by the owners it has usually been because the owners rquired it; but, outside of these influences, the architects have been in control of the work. They have decided how it should be done, and the engineer could do nothing but acquiesce in their wishes.

This wide divergence of action has, first of all, grown out of the varying conditions among the architects themselves. Some have technical training, and their best work pertains to the structural part of their problems, while others, and among them some of the best designers, have little or no taste for construction. Some architects can afford to give their own time to structural details, when it would be folly for others to do so. Some architects have a business sufficiently large to warrant the expense of regularly employing competent men in their own offices, while others cannot afford such an expense. In some cases the cost of the best technical assistance is unhesitatingly met by owners, while other work is done under circumstances which makes the employment of engineers almost prohibitive.

To some extent, this difference in practice has grown out of a fear of trusting to outside help. Some architects have been willing to try it, while others have not. The fear has been twofold; that the work would not be well done, and that the building could not be designed to advantage unless the work was all kept together. Sometimes it has been the former, sometimes the latter, and occasionally it has been a dread in both directions.

The divergence of practice is also due to a failure to appreciate good work. The structures of our cities vary in strength and stability, and in every other structural characteristic, from the wretchedly poor to the wastefully good. The engineer is not to blame; he does the best he can; but he is to blame who chooses an inexperienced or an incompetent man for important work. It is a fact that young men not long out of school, and men whose technical knowledge is very limited, are employed in offices to do work for which they would not be considered qualified in any of the leading engineers' offices of the country. They fail to do the wise thing. They can't help it. Sometimes the result is lacking in some essential feature, and sometimes it is only the lesser evil of extravagance, but whether it is the one or the other, ordinarily both the architect and the owner fail to realize its imperfections. It is only now and then, when such structures come under some extraordinary test, that the weakness becomes apparent.

There remains, however, another explanation of this divergence, a more important one perhaps than all the others put together, and that is the cost. Undoubtedly this is often the reason why inexperienced or incompetent men are employed. The question is asked too often, "How can we get the work done at the least expense?" And there are not a few extreme cases on record where the architect has tried to employ a consulting engineer by taking bids to see who would do the work for the least money. The results produced by such means are, to say the least, very unsatisfactory, and words can hardly tell how discouraging and humiliating it is to the competent engineer who is trying to do good work.

Some of the ways in which structural designing is now being done ought to be ruled out altogether, and this is particularly true of the one already referred to as the common practice in New York city ten years ago. The day is coming when no architect who values his reputation will venture to receive assistance from a manufacturer or his employes, whether that assistance is paid for in a regular way or not. It might also be added that the day is coming when no engineer regularly employed by a manufacturer, or practicing as such himself, will expect to be called on for such services. It is an old saying that, "No man can serve two masters," and it is because this is true that these relations, sooner or later, are certain to disappear; in many cases, it works to the owners' distinct disadvantage.

This is followed by a description of the methods employed by general contractors for large buildings, who have at times controlled not only the market for the steel used, but also the constructional engineering of many of the earlier high buildings, with the evident consent not only of the owners but of the architects as well. This is a practice commenced in Chicago some years since, and continued in New York and other cities where large construction companies have exercised great influence over both. He very justly condemns this method, which is ascribed to a disposition to throw off the responsibility for difficult construction upon the builder.

The employment of engineers, on salary, by architects, is also discussed, and the disadvantages of the same to all concerned are explained. Among these the following illustration is given:

All men are prone to work in ruts and to repeat their faults. If an architect is constantly dependent upon one or two men in his own office, there is no getting out of these ruts or escaping from these faults, unless it be by occasionally changing the method of having the work done, or by changing the employes themselves. One of the leading engineers of the country, in speaking of this matter recently, said: "The consulting engineer, in general practice, may be expected not only to have better and more adequate facilities, in the way of technical assistants, for doing a given piece of work, but he can also bring to bear upon this work a much greater amount of experience and knowledge derived from the greater number and variety of cases handled through his office." He also added: "I have had occasion to note several times the limited scope of the knowledge and experience of the technical assistants employed on salary by the archtects and contractors."

Mr. Purdy's opinion of the case wherein the engineer is employed by the owner should be supported most emphatically. The objections to it should not only appeal to every right-minded and honorable engineer, but to every owner who knows his own interests. We quote as follows:

The employment of the engineer by the owner, as the associate of the architect, or in general charge of the work, is also undesirable; as an associate, it divides responsibility; in charge of the work, it subordinates all other considerations to the structure. Eventually, it would be humiliating to the architect. It does not conserve the best interests of either the owner or the architect. Both arrangements are a mistake, and neither can attain a general acceptance, in or out of professional circles.

On the other hand, consideration of such a plan cannot be turned away slightly. If some solution of this difficulty is not found, if some systematic effort is not made to "standardize" this relation, if such an expression may be used, the engineer will strive to push himself forward in just such ways as these, and will meet with encouragement from the public. An opportunity to take the lead appeals to his ambition. He is almost always a practical man of affairs. On these accounts, if the situation is allowed to drift, it may never be possible to arrive at an understanding between the two professions for a uniform practice and a division of authority which may in time become fixed by public usage.

The remainder of the paper is devoted to a consideration of those cases in which a consulting engineer is employed and paid by the architect. Such a relation is evidently the only one under which the sole responsibility of the architect is maintained, and in maintaining which the architect may be assured that it is a responsibility which is shared with professional engineering skill in which he may place the highest confidence. We therefore quote from this part at considerable length:

Objections are also repeatedly made to the employment of a consulting engineer employed by the architect. It is urged that the dividing of the work is a disadvantage to the architect, and that it obstructs and delays the men employed in the architect's office on other features of the design. The desire to keep the work under personal control is usually due to this notion; but sometimes it is due to a feeling of satisfaction in doing everything oneself, and occasionally it is born of the wish to monopolize the credit of every achievement with which one has to do. These ideas and desires are not only in the larger offices, where the volume of business is sufficient to warrant their gratification, but architects having smaller practices are governed by the same ideas. A much greater difficulty, however, is the question of compensation, to which reference has already been made. The expenditure of so large a part of the architect's commission, in one sum, seems to always be a hard thing to do.

These difficulties, and these only, seem to stand in the way of the employment of the consulting engineer. To all other relations there seems to be an objection which makes them impossible, an objection which will surely prevent their final acceptance by all concerned. It might, therefore, be well to inquire particularly into these difficulties which seem to stand in the way of the employment of the consulting engineer who had a practice of his own independent of the architect. Are the objections insurmountable? Has the relation advantages of sufficient importance to warrant changing the methods which we have been using in order to secure its adoption? Let us see.

* * * * * * *

No consulting engineer can preserve his independence in business unless he can find a way of doing his work with little or no trouble to his client, and also unless he can do it quickly, making every figure and every line count in the final result. He cannot afford to have the work drag in his office, nor to speculate with uncertain data. He wants to get things settled. So does the architect; but the architect can be put off. The engineer, however, objects to doing work until things are settled. So decisions are hastened, and both the architect and the engineer get the benefit. Many times, also, the touch of the two offices with each other is like an infusion of new blood to the slower one. Sometimes it is to keep ahead of the engineer; just as a matter of rivalry, and, at other times, it is to keep him informed regarding the general construction. This particular difficulty, therefore, can always be overcome if the work is rightly managed.

The cost of the work, as already stated, has been the hardest difficulty to satisfactorily adjust. It has prevented the employment of the engineer more than anything else. If the cost of his services could always be obtained from the owner without encroachment upon the architect's regular fees, it would undoubtedly do much to simplify the problem. But the general acceptance of such an arrangement in the immediate future can hardly be hoped for. From all reports, it is often difficult to obtain the regular commission, and any charges in excess, in such cases, are impossible. If any general effort should be made by the architects or by the engineers, or by both professions co-operating, to definitely establish this relation between the two professions, and it was predicated upon the willingness of the public to pay extra commission, the movement would probably come to nothing. The public are educated slowly, and, for a good while at least, their willingness to pay the additional commission would be the exception. In the meantime, other influences are gathering headway, and they in turn would probably prevent the success of such an effort in the more distant future. The conditions are such, it seems to the writer, that such an undertaking should be made, if at all, upon some basis which can be put in operation in a comparatively short time, and which does not require the co-operation of the public. This does not mean that an extra commission from the owner is undesirable. It is desirable, and every effort, both of the architect and the engineer, should be put forth to secure it. It is probably a fact that the amount of work required of the architect in these days, in proportion to his income, is greater than it used to be. and that this additional compensation, if it may be called such, would not make the architect much, if any, better off than he would have been with the same amount of work a few years ago. It is also true that some owners have already paid this additional compensation, and that some others can be easily induced to pay it; yet, notwithstanding these points to the contrary, it is important that the success of the movement should not be dependent upon the willingness of the public to pay the extra commission.

It seems to the writer that the following points should be made with reference to this question of the engineer's compensation:

1. It should be paid by the architect.
2. It should be adequate.
3. An extra commission on account of this expense should be obtained from the owner, if possible.
4. The compensation should be a commission.
5. If an extra commission can be obtained from the owner, the engineer should get the benefit of it.
6. If the extra compensation cannot be obtained from the owner, the engineer should be content with a smaller commission.
7. The commission should be the same for all kinds of engineering pertaining to building work, structural as well as mechanical, and
8. The commission should cover only the work included in the service.

The engineer's compensation should be paid by the architect, because that is most in keeping with the subordinate relation of the engineer. It puts into the architect's hands without friction and without question the power to retain his management of the business.

The compensation should be adequate, otherwise the whole idea of establishing a permanent and satisfactory relation between the two professions will fall to pieces. The engineer will more and more assert himself, and he will not agree to any fixed relation unless it provides for a full and adequate compensation for his services.

While in the main Mr. Purdy is right in these statements, it does not seem to us that so much stress should be given to the importance of the architect getting "extra commission" from the owner "if he can," and sharing it with the engineer, or giving it all to the engineer. Neither should an architect, if he accepts inadequate compensation from his client, expect the engineer to share the loss with him. The use of the words "extra commission or compensation" is calculated to prejudice the business world against both professions. If, as claimed by Mr. Purdy, the engineer's compensation should be "adequate," it follows that that of the architect, who pays him, must first be adequate. No architect should accept employment on an important building unless his compensation is adequate—that is, supposing that he is following his profession for support, and not for amusement, advertisement or honor alone. And no engineer should accept an engagement from an architect unless he can secure adequate compensation. If owners do not pay fair prices for professional work, they generally secure inferior services and suffer for it in the end.

It is generally supposed that the commission of architects on all works of importance is 5 per cent of the cost of the building. But this, according to the schedule *recommended* by the American Institute of Architects, is defined to be the *minimum* charge. The schedule also provides for many additional charges for work out of the usual, but says nothing about charges for buildings involving necessarily the work of structural engineeers as necessary employes acting under the direction of architects and paid by them. In this it is incomplete. If the relation between the commission paid architects in ordinary practice and the actual value of what goes into the building were carefully computed, it would be found that the largest part of his commission is for the cost of the brick walls, on which the element of design only enters in the smallest degree. The architect's compensation is, therefore, only a commission on the average cost of the whole; for the greatest time is often given to that part which is of limited cost. Now, when the design necessarily introduces steel construction and requires the assistance of experts in engineering, it is evident where the new element of expense to the architect enters into the calculation. Five per cent is known to be inadequate under circumstances that give the best results to the owner, and, therefore, a new adjustment should be made which will make it possible for the architect to deal fairly with his engineer.

Mr. Purdy, if we understand him correctly in parts too long to quote, thinks the engineer can give better service if better paid, or be more careful under such circumstances. As the architect should give only his best and fullest services, it is evident that the engineer should always give the best and fullest services, under all circumstances, or refuse the engagement. Therefore, the services should bear no relation to the compensation. Compensation by commission on the cost of the work is clearly the only fair basis for an agreement, but, once settled, the work should go on without regard to it. There are no two ways for doing it.

Here, then, is what Mr. Purdy says about what the compensation should be:

> And this compensation should be a commission, though a number of the leading engineers of the country would undoubtedly prefer a fixed sum. Many of the architects are also accustomed to paying a fixed sum instead of a commission, but, notwithstanding these preferences, it is the writer's opinion that in all ordinary cases it should be a commission. If any arrangement is made to establish a definite and fixed relation between the two professions, it must unquestionably cover the problem of compensation, and that can be stated in the terms of a commission definitely, equitably and generally, while it cannot be stated in any general terms on the basis of a fixed sum. Moreover, such a plan can be carried out and the adequate compensation of the engineer can be maintained in that way with the least friction. It also enables the architect to compare the amount he pays out with that which he receives, which he cannot readily do if the engineer's compensation is fixed in any other way.
>
> In any case, the architect ought not to be obliged to pay out all he receives. It is right that the engineer should be adequately paid; but it is also right that there should be a fair division. If it is worth while to undertake to establish a fixed relation between the two professions, which can be maintained whether the public fall into line or not, and the architect is to employ the engineer, whether he receives the extra commission or not, the engineer should be expected to serve in any case and to receive a less compensation if necessary.

Mr. Purdy then proceeds to suggest a solution of the problem, "what the compensation of the engineer should actually be." He suggests that if the architect receives 5 per cent on the total cost of the building, the engineer should receive from him 2½ per cent of the contract price of all the work that it falls to him to design, to be paid for the drawings and computations. If he should be called upon to supervise the execution of the steel frame or any other work that he has designed, he puts the compensation for the drawings and supervision at 3½ per cent. This would leave the architect only 1½ per cent on that part of the building. Whether or not this is reasonable we do not pretend to judge. There is no doubt that it would be "adequate" from Mr. Purdy's point of view. If the architect should do the whole work on a 7½ per cent basis—which, under present conditions, we are bound to consider as problematical—he thinks the engineer should receive 3½ per cent on the price of execution, for the drawings made by him, or 5 per cent if he should supervise the same work also. This schedule might work very well for steel skeletons, but it would be very difficult to adjust it for foundations, retaining walls and other constructions. The reason is that it is difficult to determine the cost when it is so intimately involved with other parts of the building. Perhaps a fixed sum for such services would be more practicable.

Our next quotation refers to the question, "Has the relation advantages of sufficient importance to warrant changing other methods we have been using in order to secure its adoption?"

There are, perhaps, twenty-five or more engineers of large experience in the several departments of building construction now in independent practice in different parts of the United States, and the most eminent and the most capable men in the world in these departments of work are to be found in this number. The moneyed interests of the country are awakening to a greater conception of the importance of good structural and mechanical designing, and more and more, in the future, they are going to require technical services of a high order. They will eventually force the situation. Unless some arrangement is made for co-operation, most of these engineers will, sooner or later, be employed by the interests that now employ the architects, and the more this is done the more difficult it is going to be to standardize the relation of architect and engineer. In this same connection it should not be forgotten that the schools of our country are turning out well-trained young men in the engineering profession, several thousands of them each year, a considerable part of whom are going into building work. This will certainly have its effect in another generation. An evolution is in progress. Shall we drift with the current, or shall we control it? It would seem to be better to fashion events, and not let them fashion us. It would seem to be better to yield a little more here and a little more there of our individual preferences, in order to secure the common good. It would seem to be better, possibly, to sacrifice something at the present time, if thereby a reasonable relation between the two professions may be fixed and maintained.

In this day of the centralization of power and responsibility, the best interests of the owner are unquestionably subserved by making one man responsible, and only one. I confidently believe that no practice can become uniformly acceptable; no relation between architects and engineers can ever give satisfaction, that is not founded on this fundamental idea—the centralization of responsibility in one man. If this is true, engineers should not hesitate to accept a position of subordinate service, for it may be reasonably contended that the architect is the one man that should be in this position of supreme control. Not only is precedent in his favor, but the character of his work and the wide range of its requirements especially fit him for this larger responsibility. In this new dispensation, whatever else he is, he must be a man of affairs in the architectural world, and the engineer cannot take the place of responsibility, however well qualified he may be for doing so, without subordinating his technical work to the larger demands of such management.

On the other hand, the architects should not fail to appreciate the changing conditions. They should not hesitate to meet the engineers half way. They want only reasonable profits for their labor, an undivided responsibility in their own departments, and the credit which is due to them for really worthy achievement. Less than this they will not be content with.

The architect in full control of the planning and execution of every great architectural undertaking, retaining structural and mechanical engineers who have their own independent practice, and sharing with them the emoluments and the honors of their achievements; the engineer laboring independently within his own province, without limitations, except by the financial and architectural conditions of his problems, receiving adequate compensation while he maintains the position of the architect; such is the ideal relationship of architect and engineer; and particularly so if both individuals are broad-minded and reasonable, and, over all, there be mutual sympathy.

His concluding remarks were as follows:

Only one thing more remains to be said: Certain things must be done, if we would undertake to establish such a relation:

1. It must be deliberately worked for. It will not come drifting.
2. It must be a co-operative effort.
3. It must be a general effort.
4. It must be undertaken in a spirit of compromise and good-will.

If a committee were appointed by the American

Institute of Architects to consider this matter and to confer with the engineers, the latter would undoubtedly find some acceptable way of meeting them. There is certainly a great deal of dissatisfaction with present conditions, and a number of the leading engineers have already expressed their wish that some action might be taken to put the relation of the architects and engineers upon a better basis. Any such effort will come to naught, however, unless it is undertaken in a spirit of compromise and good-will. There must be, on the part of the engineers, a willingness to take a subordinate part and to support the architects in maintaining that relation, even though sometimes it may require an apparent sacrifice; and there must be, upon the part of the architects, a willingness to share both in their compensation and in the credit of their achievements.

The convention appointed such a committee.

Y. M. C. A. BUILDING, WASHINGTON, D. C.

HARDING & UPMAN, ARCHITECTS.

The steelwork for this building is nearly completed, as will be seen by the photograph. It is of skeleton construction throughout, plate and lattice columns and floor beams about six feet centers, filled in with flat hollow tile arches. The partitions are all of hollow tile and the building will be of absolutely fireproof construction throughout.

It is one of the best thought-out and planned Y. M. C. A. buildings in the country, and reflects great credit upon the architects, who have given it such careful study. It is six stories in height and has a frontage on G street of seventy-six feet, adjoining the old Columbia Athletic Club, now used as the Y. M. C. A. club house, and is one hundred and seventy-two feet deep, with an extension on the rear in the shape of a letter "T," one hundred and seventy-nine feet long.

The basement contains two thousand lockers, six bowling alleys and casino, barber shop, sterilizing room, shower baths, drying room, Turkish bath, toilet, heating and ventilating plant and a swimming pool, twenty by eighty feet.

The first floor contains reception hall, seventy-two by fifty feet, buffet, trophy room, general office, secretary's offices, check room, examination rooms, physical directors' rooms, two hundred large lockers and private dressing rooms, club rooms for members, and a gymnasium one hundred and twelve by forty-eight feet.

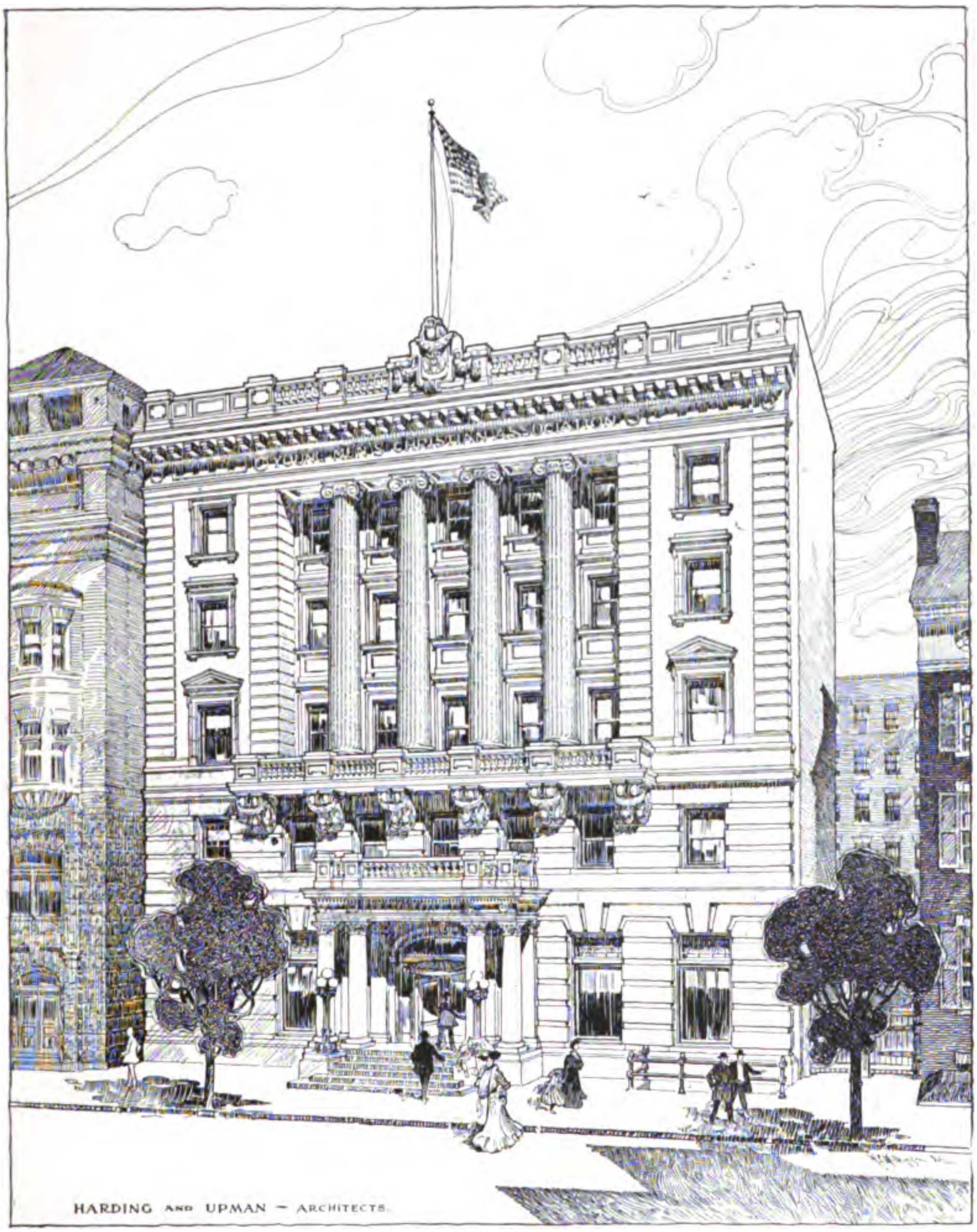
The second floor contains recreation room, directors' rooms, records, Bible Study Club, Volunteer League, Yoke Fellows, Camera Club room, running track, individual exercise rooms, and rooms for wrestling, fencing, etc.

The third floor is the educational department, has the assembly hall, seating 300 people, offices of educational directors, class rooms for business branches, languages, mathematics, chemical and electrical laboratories, mechanical and other drawing rooms, and handball courts.

The fourth and fifth floors contain ninety dormitories for men, with private baths, and general baths, etc., on each floor.

The sixth floor has the roof garden, public and private dining halls, kitchen, laundry, refrigerator plant, etc.

The total floor area is about 100,000 square feet and the building, when completed, will probably be the largest, best arranged and most complete of its kind in the world. Architects from all over the country are examining it with greatest interest and it will serve as a model, undoubtedly, for a great many similar buildings. The walls are of brick, stone and terra cotta, and all the partitions, column covering, etc., are of hollow tile.


HARDING AND UPMAN — ARCHITECTS.

Y. M. C. A. BUILDING, WASHINGTON, D. C.
Harding & Upman, Architects

The above illustration from the architects' perspective drawing shows the front of the building when completed. On the following page we give an illustration from a photograph taken in January. The steel skeleton was then completed, the hollow tile floor arches were set up to the fourth floor and the setting of the stone front had been commenced.

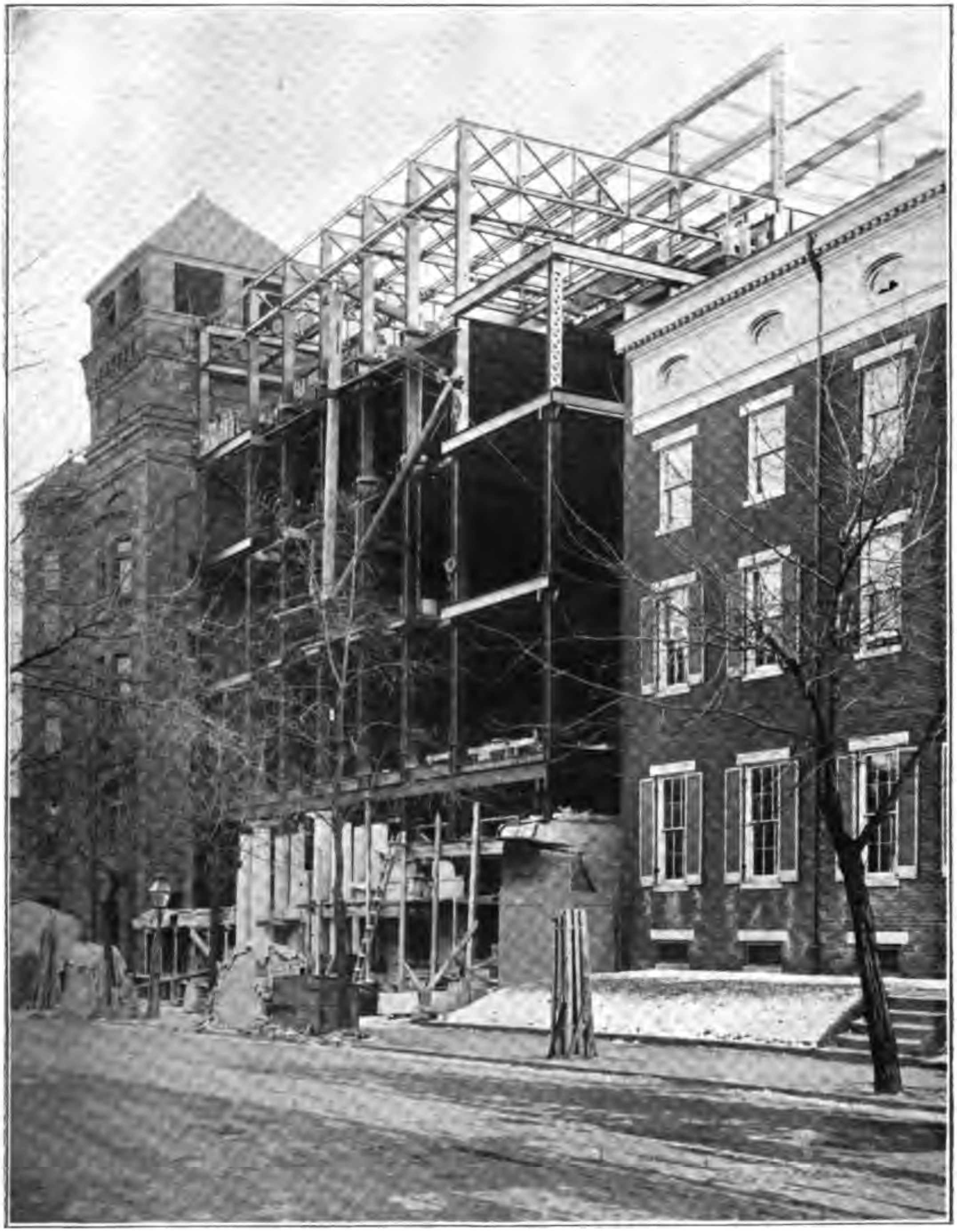


ILLUSTRATION OF STEEL SKELETON CONSTRUCTION OF THE Y. M. C. A. BUILDING, WASHINGTON, D. C.—FROM A PHOTOGRAPH TAKEN IN JANUARY.

LOSS OF LIFE IN UNITED STATES BY FIRE—SOME APPALLING FIGURES

SO remote do most of us regard the life-hazard of fire, that the following statistical excerpts and comparisons will come as a surprise. The calculations themselves are based upon insurance year books, vital statistics and the twelfth federal census. They are taken from the last general statistical period of twelve months covering life loss by this cause throughout the entire country. During the last census year, deaths resulting from fire reached the unprecedented total of 6,672. Or over five hundred lives sacrificed each and every month to the destroying element. The proportion of life loss averages, during the period, about evenly, a little under 9 per 100,000, but showing an increase from 5.5 in 1890 to that of 8.8 in 1900 per 100,000 of population.

Readers of FIREPROOF MAGAZINE in the different sections of the United States will read with interest, and, we fear, with dread, the figures for the following states and cities respectively:

Illinois, 315; Chicago, 136 of the total.

Indiana, 173; Indianapolis, 14 of the total.

Iowa, 91 ***reported.***

Michigan, 161; Detroit, 25 of the total.

Minnesota, 100; Minneapolis, 14 of the total.

St. Louis, 72.

New Jersey, 188.

New York State, 561; Greater New York, 342.

Ohio, 289; Cleveland, 39; Cincinnati, 20.

Pennsylvania, 641; Scranton, 24; Wilkesbarre, 15; Alleghany, 20; Philadelphia, 142; Pittsburgh, 49.

Virginia, 271.

Wisconsin, 123; Milwaukee, 25.

Some striking comparisons are afforded by the following illustrative ratios:

One thousand more persons lost their lives through fire than the whole number of those drowned; the figures stand: Burned, fire, etc., *6,772;* drowned, 5,387.

Railroad accidents, killed, 6,930. Fire, *6,772.*

Rheumatism claimed 5,067 victims—fire, *6,772.*

Scarlet fever sacrificed 6,333 lives—fire, *6,772.*

Smallpox—of which we hear so much, and which arouses the intensest administrative agitation—satisfied its death claim with 3,484—*fire, 6,772.*

What has been the ghastly inscription for 1904 we may not yet know, but the increase of the ratio between the years 1890 and 1900 marks the drift unmistakably enough—and emphasizes more than ever the desperate need for building reform and fireproofing safeguards of tested merit.

THE AMERICAN INSTITUTE OF ARCHITECTS TO BE REPRESENTED IN THE NATIONAL FIRE PROTECTION ASSOCIATION

At the thirty-eighth annual convention of the institute, held at Washington, January 11, 12 and 13, Alfred Stone of Providence, R. I., who had attended the meetings of the National Fire Protection Association during the past year, presented a report of its doings, and stated that at the last annual meeting it passed amendments to the articles of association, so as to include the architectural and engineering societies, and invited the American Institute of Architects to become an active member. The report was accepted and in accordance therewith the following resolution was adopted:

"Resolved, That the American Institute of Architects accepts the invitation to become an active member of the National Fire Protection Association, and authorizes its president to appoint one or more delegates to represent it at the stated meetings of the association and to act on committees thereof."

A CHAT WITH THE LADIES ABOUT HOUSE BUILDING

F. W. FITZPATRICK.

> "Every wise woman buildeth her house........
> a wide house and large chambers, and
> cutteth out windows; and it is ceiled
> with cedar and painted with vermilion. . ."

YOU see that even in the time of Jeremiah the women wanted big rooms and many windows, and, undoubtedly, innumerable closets and cubbyholes, and cosy corners, probably more than some of their good husbands might well pay for. In a great many respects the women of those days differed not from those of our own time. In building a house to-day the average woman wants just about three times as many rooms as she can possibly get for the money the family has set aside to build the home, but in this particular chat I will have no quarrel with her as to the number of rooms she wants and thinks she ought to have, where the flagpole ought to be and the particular location of the kitchen sink, or, for that matter, even the painting of her house with vermilion, but I am going to scold about the "ceiling of that house with cedar;" in other words, this is going to be a little sermon on fireproofing.

The Hebrews of old built almost exclusively of wood, even Solomon built his magnificent temple of cedar and other costly timbers, and as a result we have absolutely nothing in the way of historical remains of those days. Our fathers, at least those who dwelt in this country, also built of wood, for the same reason that the Hebrews did—it was the most available material—and we have clung to that habit as we cling to many habits, without rhyme or reason. True, clap-boarding and shingles can be very artistically combined, and there are indeed some very tasty frame homes wherever we may turn our eyes. But none of these homes so built is *safe*. In the hearts of large cities and within certain zones outside of those hearts even, they are not permitted, because of the dangerous character of their construction; in the suburbs they are exposed to the dangers of fire from within and innumerable dangers from adjacent fires, though the fire departments in most cities are so well organized that total loss is far less frequent than formerly. When once a house so constructed caught fire there was small hope for it. Few country places have any semblance of fire protection, and the result is total loss. Something like 80,000 houses burned down last year in this country. True, 42,000 of those were insured, and the people got some balm with which to soothe their lacerated purses, but remember, for every dollar a community gets from the insurance companies it has paid in to those companies three dollars in premiums. In other words, we pay out every year something like $500,000,000 in insurance premiums!

Men have learned, by hard experience, the folly of flimsy building. It used to be one of our national crimes. Apart from the Chinese and Japanese few peoples on earth have built as poorly as we did some years ago—and many of us do still. Business men have come to realize the tremendous loss the country incurs every year—absolute loss is the fire loss. Many things that are deemed losses are really but exchanges, a disadvantage to one, a gain to another, but with fire there is something like $150,000,000* of property that is swept away, absolutely, and without advantage to any community every year. Our men have seen this and the result is a general demand for better buildings, more fireproof construction. Some cities have advanced far enough along the lines of progress so that they will not permit any but fireproof construction within rather wide limits. But our women still insist on having wooden houses, with their more or less elaborate wood trimmings inside, wooden porches outside, shingle roofs, "ceiled with cedar" in the fullest sense of the term and made just about as inflammable as is possible for an ingenious architect to devise—and our houses, therefore, contribute very largely to the annual ash heap. Just think of it, the bonnets and sealskin sacques and other pretty things that could be purchased with that wasted $150,000,000!

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*That figure represents the average loss for a good many years. It has been $170,000,000 or thereabout for the past few years, and in 1904 it reached the appalling sum of $230,000,000!

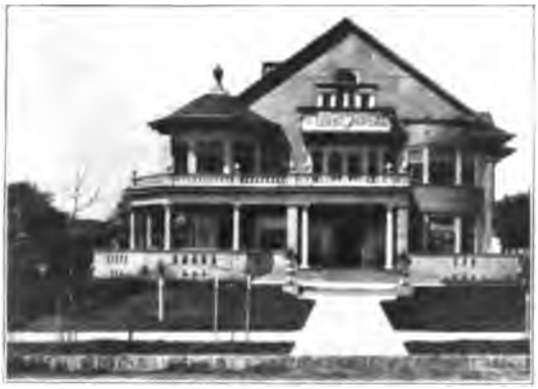
Until comparatively recent years one excuse for building of wood was that it cost so much less than any other material, and, in fact, even moderately fireproof dwellings were beyond the reach of any but the wealthy. It is no longer so. There is really no object for building of wood to-day. Most of us keep on doing it simply and solely because we have gotten into the habit of it, and that there are large sections of country where we have not yet been prohibited from using it. Lumber is growing scarcer every day, it has gone far above 100 per cent over its cost twenty years ago, while brick, and tile, and cement, and other incombustible and indestructible materials are cheaper by far than they were at that same period.

I am not contending for merely the elimination of wood in the exterior finish and construction of houses. Many people believe that the moment they have their outside walls of brick or stone, and the roof of slate or tile, their homes are fireproof. The floor joists, the partitions, all the interior framing and finish are of wood and become as dry as tinder in the course of a few years. The spaces between the rafters and floor joists, and partition studdings, are just so many flues. No sooner is there a little fire in the cellar or kitchen, or some out-of-the-way corner, than—pst! there it is in the roof and all over the house. Lives are endangered and much that the good housewife holds dear is destroyed, though the house itself may possibly be repaired. On that account do I aim my bolt at everything that is wood or inflammable or destructible by fire in a house.

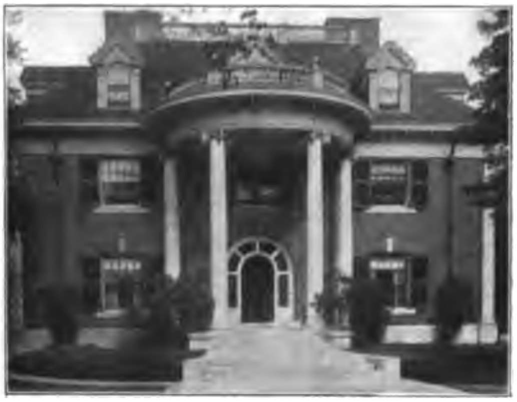
The exterior walls should be of brick and terra cotta—stone is all right under ordinary circumstances, but if there is ever a good, hot fire anywhere near it, stone is destroyed almost as effectively as is wood—while the floors and partitions and roof, all the construction in fact, should be of absolutely non-inflammable materials. The ladies will say: "But that will cost four or five times what we have to spend on our houses." Excuse me, but it does not. Conditions, of course, differ in the various parts of the country, but as a general average I may say that a thoroughly fireproof house will not cost (in its initial expenditure) more than 7 per cent over the cost of the usual wooden construction with wood joists and stud partitions, and lath, while, taking into consideration the fewer repairs required to keep such a house in condition, its far longer life, the lessened insurance—if, indeed, any need be carried—the investment in a fireproof house is no greater anywhere in the country than is that in an ordinary structure. Many times, in fact, the initial cost of the better mode is even less than that of the poor one. I have bids before me now for both modes of construction of a very modest house here in Washington. The lowest figure for the old-fashioned wood framing is $5,875, while the bid for hollow tile fireproof construction is but $5,186. A number of fireproof houses have just been completed in Pittsburg. They have cost (ready for occupancy) $4,500 each, and that includes some few little extras that have been thought of as the building went on. The lowest bids on those houses for wood construction were $4,000 and $4,125. Why, anyone can figure it up for herself. In the ordinary city house the wide span floors have twelve-inch joists; between those joists there is laid a couple of inches of cinder concrete, or other noise-deadening material, in the vain endeavor to lessen the noises from overhead; there is a rough flooring on top, with a finished maple, narrow-strip flooring covering that, and plastering on the under side forming the ceiling of the story below. Now such a floor and ceiling in the completed stage costs here in Washington 40 cents a square foot. There will be a variation of two or three cents in different localities. Eliminating the maple floor and taking out the deadening, using a finished pine floor, as is done in the cheapest kind of dwellings, and you have an expenditure of at least 28 cents a square foot. Partitions built of two-by-four wood stud, wood lathing both sides and plastered both sides will average 20 cents a square foot pretty much all over the country. So much for the wood. In fireproof construction the Johnson system of heavy tile flooring, suitable for spans up to twenty feet, is about the cheapest and best thing that can be used. Built in the most substantial manner, finished with an asbestolithic or granolithic, or other incombustible plastic flooring, the under side of the floor plastered and all finished in good shape—fireproof, soundproof and vermin-proof—costs from 26 to 28 cents a square foot in almost any section of the country not too remote from the large centers, while a four-inch hollow tile partition, plastered both sides, will cost not to exceed 18 to 20 cents a square foot. You see that in spite of the general supposition that fireproof construction is exceedingly costly, it is not.

I am not advocating anything startlingly new, nor a great reform in building material, nor anything of that sort, but am simply urging the adoption of as sensible a mode of construction in our houses as we have gotten into the way of using in our larger buildings. Building fireproof houses has become as necessary as the building of fireproof stores, hotels, apartment houses and other places "where humans do congregate." It is not sensible, it is positively indecent to keep on building with the old flimsy methods, exposing life and property to the dangers that we know are ever present, as we have done in the past from motives of alleged economy, that have in reality proven to be the rankest extravagance. With a judicious expenditure of $150,000,000 a year in this country, instead of burning it on the altar of folly and ignorance, we could soon have even our oldest cities so reconstructed as to obviate the necessity of maintaining our numerous fire departments, at a further expenditure of at least $50,000,000 more per year! All that I am advocating or urging is that the ladies forego the little pleasure they may derive from their dainty minarets of shingles, scroll-saw ornaments, beautiful green-stained shingle sides to their houses and the endless wood—wood—wood trimming and finishing that is simply pretty because we have grown used to it, and substitute in the place of all this highly combustible material other materials that will not burn and that are not damaged if an incipient fire does occur. in the house furnishings, carpets, etc. Brick and tile are the two materials that fulfill that requirement, but if they are used almost exclusively in the structural parts of a house, slate and stone and metal, that are damageable by fire, may be used with more or less generosity, because the possibility of their being damaged is virtually eliminated by the use of brick and tile construction.

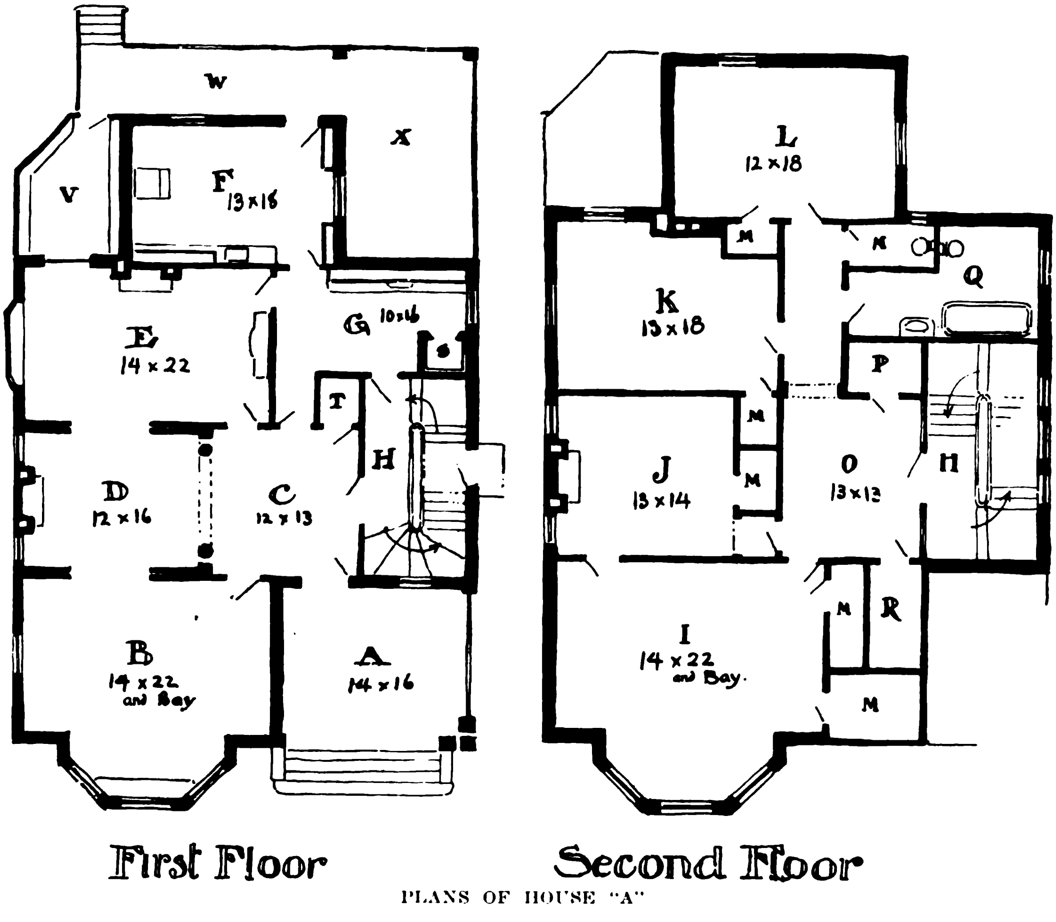
Don't imagine for a moment, ladies, that brick and tile and stone are the unyielding materials that you have perhaps heretofore thought them to be, believing that a wooden house was the only one that could be made "pretty." "D," for instance, is a fair example of a pretty frame house, suitable for suburban residence. It, in a general way, can be made to fit plan "A" of a fireproof house that I herewith illustrate from rough studies I have just made for a house in Portland, Ore. Now, I submit, that the brick exteriors "E" or "F," are just as handsome, just as "pretty" and dainty, as exterior "D." They are selected at random from a mass of illustrations. "E" is



FRAME HOUSE, "D," IN CALIFORNIA



BRICK HOUSE "E"



First Floor

Second Floor

PLANS OF HOUSE "A"

a finished brick exterior, with slate roof, suitable to, or in keeping with, the general style prevailing in the South and in the New England States, somewhat colonial. "F" is a stucco house and tile roof particularly adapted to California and the far South. This house "A" is to cost not one penny over $8,000. The sizes of the rooms are indicated on the sketches. It will be absolutely fireproof in that not one inch of wood will enter into the construction. The outer walls will be brick, the roof slate, the partitions of hollow, fireproof tile, and the floors of what is known as the Johnson system of tile construction, just as cheap as the wood, and five thousand times better. But in even such a house there is the possibility of quite a hot fire. There is always a mass of furniture, draperies and carpets, and until such things are made of steel and woven of asbestos, incipient fires at least are possible, and very probable, where servants are negligent in handling fire and where the ubiquitous small boy loves to play with the matches. The great danger with an incipient fire in a room is that it will spread, and particularly upward if it is in the lower stories. In a great cotton warehouse, for instance, all on one floor, it will take hours and hours for that cotton to be consumed, while the same amount of cotton, placed in a five or six story warehouse, with stairways and elevators opening on every floor, will be totally consumed in as many minutes as it will take hours in the other case. The main tendency of fire is, of course, upward, and the most potent agent in its spread in a house is the everlasting, beautiful (?) open-work stairway. So that even in this fireproof house I enclose the stairway in a fireproof partition, and the windows opening from that stairway hall "H" into the other parts of the house are of metal sash and wire glass, and the doors opening from the other rooms are automatically self-closing, fireproof doors. The thing is that a person going up or down stairs has to open a door. It may be deemed a slight inconvenience, but some day that very act may mean the saving of your children's or your own lives. Even if you still persist in building of wood, in Heaven's name, close off your stairways, so that every floor may be a separate entity and the stairway not a means of at least immediate communication of fire from below. Apart from this fire question, did you ever stop to think that the open stairway, while perhaps rather attractive esthetically, adds just about 15 per cent to your cares, work and inconvenience? Every time you sweep a room in the upper stories you are merely transferring dirt to your lower stories. The stair means a draught all winter, the addition of about 12 per cent to your coal bill, and oftentimes the addition of a very large per cent to your doctor's bills. You have company downstairs and everything going on upstairs is heard—awfully embarrassing at times. Altogether, I consider the "feature" open stairway one of the worst curses of our modern house construction; a menace to life, health, comfort and peace of mind. So, the thing to do, however you build, is to close off your stairways. This house "A" is merely typical, a thousand modifications of the plans are possible, and, indeed, any plan of a house can easily be modified so that the materials used may be non-com-

STUCCOED HOUSE "F"

bustible and the means of communication of fire eliminated—and your house becomes a fireproof one.

Views "H" and "J" of houses by Architect Myron Hunt of Chicago, "I" of a house by Architect Otis of Chicago also, and "K" of a house in Denver, are all eminently fitted for the encasing of fireproof construction.

HOUSE "H"
Myron Hunt, Architect

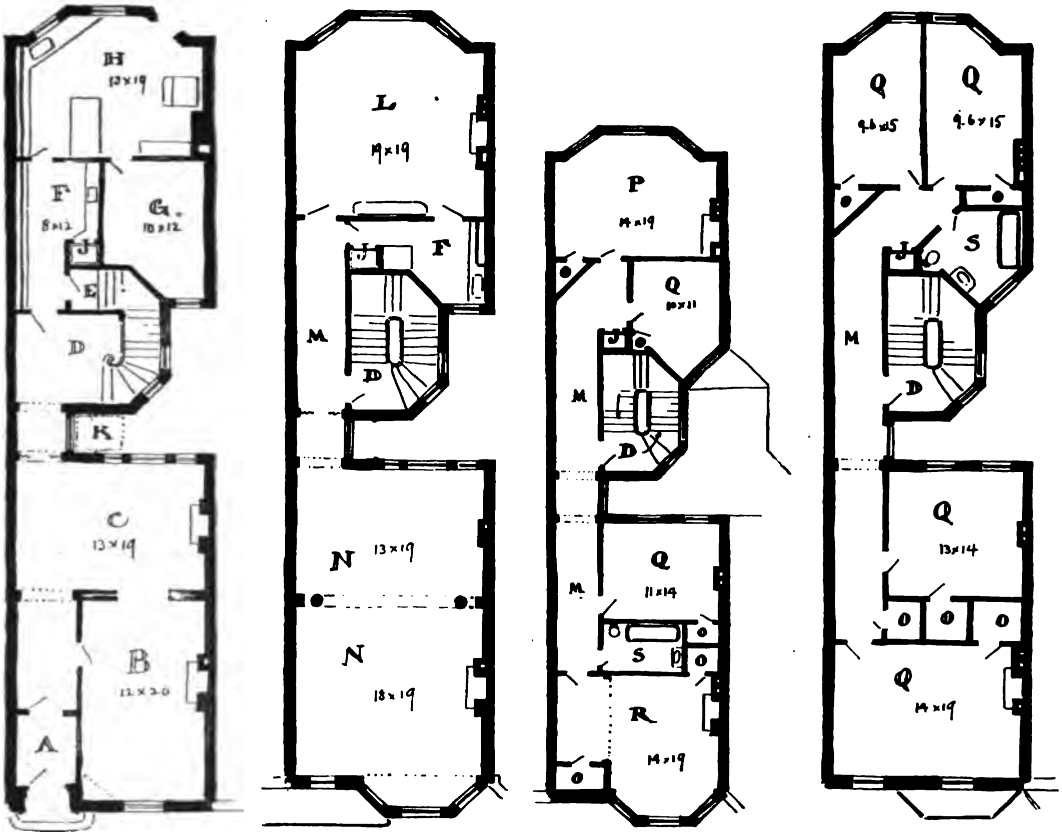
In the crowded residence portions of cities fireproofed houses are even more necessary than in the suburbs. Sketches of the floor plan of house "C" are studies made of a row of eight houses in Philadelphia. The construction will be absolutely fireproof, the stairs are enclosed, well lighted and with automatic doors in fireproof partitions between stairs and the halls. Usually, what with front and back stairs, a little over one-fifth of the available floor space is thrown to stair room. By a rather ingenious arrangement it will be observed that in this house, as in house "A," the one stairway is made to serve all purposes and can be made so, not only conveniently, but with absolute satisfaction, eliminating the necessity for servants passing through living rooms to get to the stairway, as is unavoidable ordinarily where but the one stair-

HOUSE "J"
Myron Hunt, Architect

HOUSE "K" AT DENVER, COLO.
W. A. Otis, Architect

HOUSE "I"

way is used. All the windows in the light courts, that, as will be observed by third floor plan, are large and sightly, are of metal sash and wired glass, and every precaution is taken to avoid any possible damage from fire within or from without. The dumb-waiter is arranged with automatic doors, same as are all other openings through the floors. Exteriors "L," by Architect Wilson Eyre, Jr., of Philadelphia, "M," by Holabird & Roche of Chicago, and "N," by Pond & Pond, also of Chicago, taken at random, could be easily adapted to this plan and are well fitted to clothe fireproof construction.



·First Floor· Second Floor Third Floor Fourth Floor

HOUSE "C"

House "B" is of a class that many of my readers may be interested in, but that, unfortunately, few are able to build. It is the residence (for the winter months) of Mr. H., a very wealthy man, who spends only a few months at the height of the season in Washington, and who intends this house not only as a home during those periods, but as a place of very sumptuous entertaining. He has been burned out of house and home three times in his life, so that he was an easy convert to my advocacy of fireproof construction. More than that, he has given the subject some study, under proper direction, and has become something of an enthusiast on the subject. Everybody who gives the matter the slightest thought and has good sense is bound to become enthusiastic on the subject. The sketches for the plans and exterior are but my first rough studies and are therefore susceptible to some modifications, but I am safe in saying that they will not be many, and that the house, when completed next year, will be the nearest absolutely fireproof residence that has yet been constructed in the country. Not only are the constructive features to be fireproof, but the finished floors are to be of asbestolithic cement, marble mosaic and other such materials; the window sashes all of metal, with the glass on the sides and rear of the house wired, but the door casings, etc., will be molded and ornamented in Keene's cement, and the doors themselves will be of pressed metal, so that there will not be $50 worth of woodwork in this entire house, that I estimate will cost somewhere about $40,000, though the gentleman may increase that another $10,000 by reason of certain personal whims of his, such as a private telephone system from every room, sick calls from children's room to his own, elaborate mural decorations, and all that sort of thing. He is a man who actually has to be anchored down to keep him from making extravagant expenditures on this house. One point on which we agree perfectly, however, is that he thoroughly approves of the exterior, which, as will be noticed, is almost severely plain. I hate to see people spend money frivolously and for ge-gaws and useless over-ornamentation. It always seems like a placarding of dollar bills over a house with the idea of calling the public's attention to the fact that its owner is "somebody" and does not have to economize.

HOUSE "L"
Wilson Eyre Jr., Architect

Note the general arrangement of this house, and how it is adapted to social functions. In case of reception, dinner or anything of that kind, rooms "I and H" on the ground floor become dressing rooms, while the next story, the first, is exclusively planned for such functions. The dining room will be particularly handsome and is a large room, 20x32. By a judicious arrangement of tables thirty people can be seated in that room. His is a large famliy, and without company twelve sit at table usually. Note that the second floor is devoted to the day-living apartments, while on the third floor Mr. and Mrs. H. and the nurse have the four younger children close by at night. The two young men of the family, who are out at clubs and society affairs a good deal, have their rooms on the second floor, where late comings-in will not awaken the rest of the family. There is managed a sub-basement under the rear portion of this house for heating plant, ventilating plant, elevator machinery, laundry, etc. There are but two servants' rooms in the house, for the upper servants. You know that here in Washington nearly all of our colored servants live at their own homes, so no provision has to be made for them. Some may wonder at the absence of grand and monumental stairways in this house. That is a feature that I have absolutely eliminated. There is a passenger elevator, arranged in fireproof partitions and with automatic fire doors, that serves every floor. It will be an electrical arrangement and can be operated with perfect safety by even a small child. By an ingenious system of switches, you can stop it at any desired floor by merely touching that button, and the doors cannot be opened by anyone else while it is in operation. There is not half as much danger of accident in such an elevator as there is in a stairway. At the rear of the house there is a very handsome staircase, fireproof, for general purposes, and to be used in case of accident to the elevator, which is somewhat remote, as connections are made with two powers.

HOUSE "M"
Holabird & Roche, Architects

There is another point about which I want to say a word to the ladies. I contend that anyone building a house, a city house, of more than two stories, and that costs over $18,000, is not forgivable if he or she does not install an elevator instead of a stairway. People hold up their hands and say it is all nonsense. They did the same thing about the electric car, and they did the same thing about every innovation that has now become an absolute necessity. We are getting electric elevators so that the machinery is simple, takes little space, is absolutely safe and easy of operation and that costs but comparatively little for installation. The three and four storied city house is the cause of, I am safe in saying, one-half the physical troubles that beset womankind. It's a never-ending up-and-down stairs and means not only physical ills, but the shortening of the life of many a woman many months, if not years. Ask any doctor and he will corroborate this statement, and to combat the "innovation," as it is called, is as silly as to clamor for stage coaches as a means of transportation in these days of steam and electric railways. The house elevator is a thing that is near

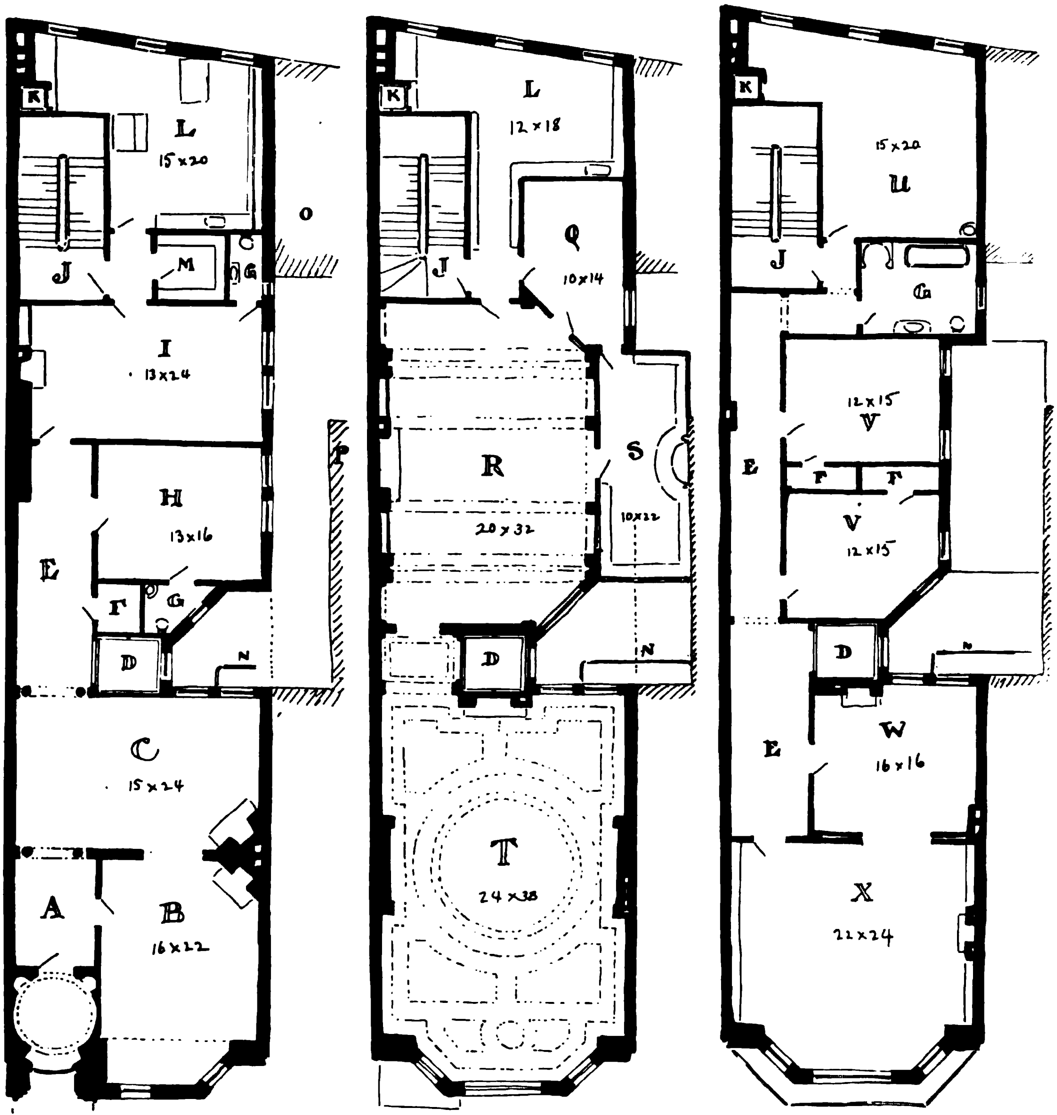
HOUSE "N"
Pond & Pond, Architects

at hand, and any man who can spend over $18,000 or $20,000 on a city house is not a sane man nor a just man if he does not devote a small portion of that expenditure to the prolongation of at least his wife's life by the elimination of that eternal stair-climbing. Ten years from now elevators, even in houses of two stories, will be as common as electric street cars are to-day.

FRONT ELEVATION OF HOUSE "B"
From Drawings

One more word, then I will leave you in peace. This is on the question of cost of buildings. Women are so very sensible, in fact, so much more so than men on most things, that it is really surprising to note how prone they are to fly off the handle, as it were, when it comes to building a house. They see a very nice house that Mr. So-and-So built, and which cost perhaps $20,000 or $25,000, and they want to build one just about like it, but they have only $6,000 or $7,000 available, and it immediately becomes a case of trying to blandish the architect into "giving" them bigger rooms or so many more rooms than he at first planned, just as though he had anything to do with, or could in any way influence, the standard cost of materials and labor. He often promises with a grand flourish, just as though by some magic incantation of wielding of a secret wand he could get brick for so much less than cost, and other material in the same way, and kind-hearted workmen to labor on that special house for $1.50 per day, instead of $5. Some of the profession, I am sorry to have to say, sin so grievously as to not only promise all sorts of things, but actually to manipulate their plans and specifications so that the contract, or first cost, will be within the limits set by the owner. But then, as soon as the over-confiding owner begins building, there is a little extra for this and something for the other item that had been neglected and made necessary by a change insisted up by Mrs. So-and-So, until in the end the cost to you is indefinitely increased. This has become so recognized a proceeding, in fact, that many people are not frank with their architects and don't tell them in the beginning how much they are willing to spend.

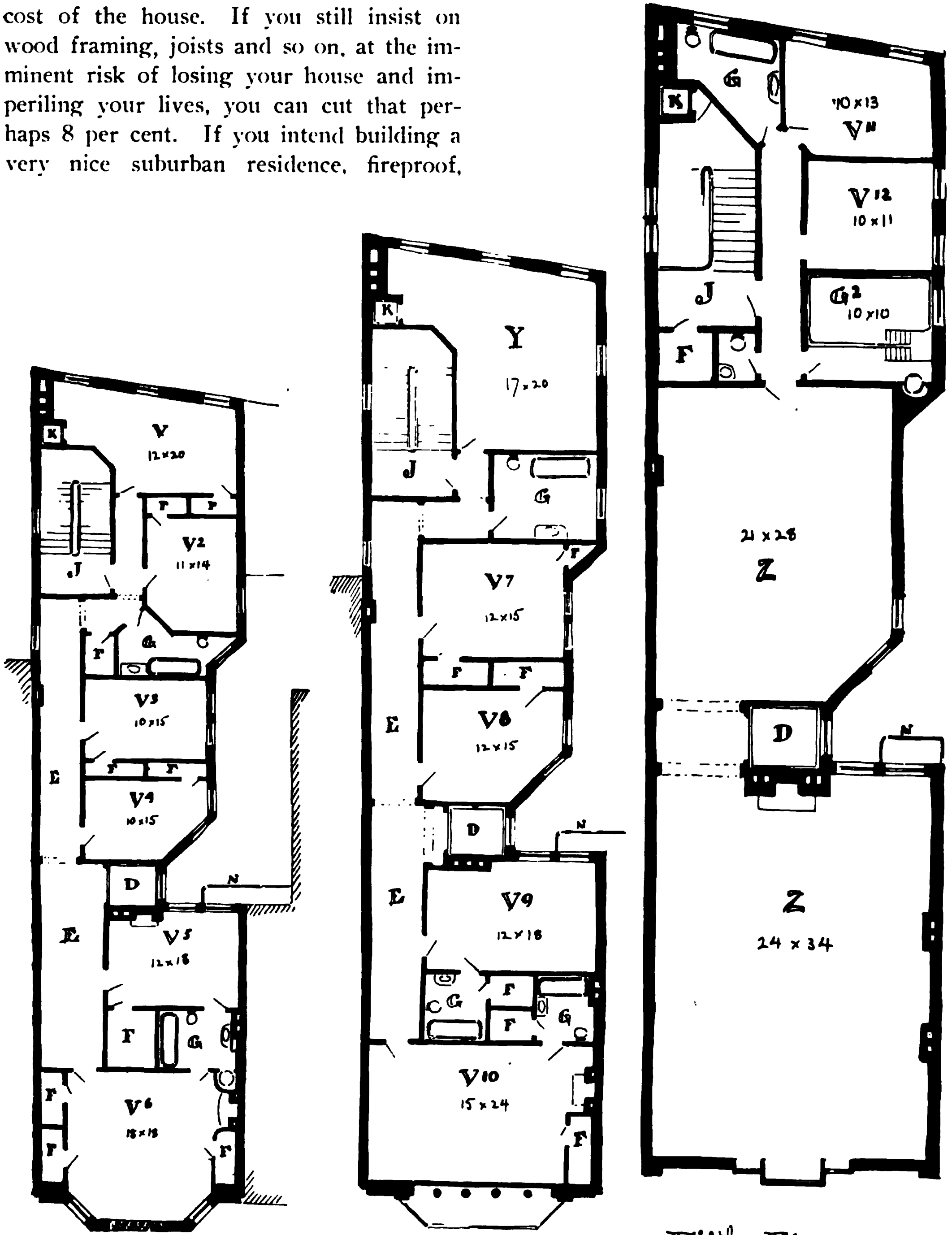
If the good women will but use their pencils for a few minutes, either on the rough draft they may make from their own ideas of what they want in a house, or upon plans submitted them by an architect, they can save themselves a mighty lot of tribulation, worry, and perhaps the serious financial embarrassment of their husbands. A building may be much ornamented, or may be reduced to its simplest form, but there are certain essentials that are standard in cost, and that even the most conscientious and ablest architect can vary from but slightly. In other words, a house of a certain size is going to cost a certain amount of money, anyway. You can add all you want to it in the way of frills and furbelows, but the vitals, the carcass, the plain epidermis will cost so much for certain classes of work, all the anxious and complacent architects and kind friends to the contrary notwithstanding. Measure your rooms, one by one, their length by their width and multiply that by the height of your intended story; that will give you the cubic contents in feet of each room; add these together and you have the total cubic contents of your proposed house. If it is a city house and you are satisfied with good, ordinary finish, some hardwood on the first



· Ground Floor · · First Floor · · Second Floor ·

PLANS OF HOUSE "B"

floor, for instance; good, ordinary plumbing; a plain, nice, brick house, thoroughly fireproofed, multiply those cubic contents by 12 cents and that will give you the minimum cost of the house. If you still insist on wood framing, joists and so on, at the imminent risk of losing your house and imperiling your lives, you can cut that perhaps 8 per cent. If you intend building a very nice suburban residence, fireproof, with plenty of nice finish, extra plumbing, an all-round, very good house, you can't get into it under 22 or 23 cents a cubic



·Third Floor· · Fourth Floor· · Fifth Floor·

PLANS OF HOUSE "B"

foot. If you are satisfied with a much plainer dwelling, no hardwood finish, very ordinary plumbing and not so much of it, but all fireproof in construction, you can do it for from 15 cents up, with the same reduction of about 8 per cent on that first cost for a flimsily built, wooden affair. If you will be satisfied with the plainest kind of a frame house, with the minimum of cornice work, cut shingles, one thickness of ordinary pine flooring, about as cheap a house as you can imagine, you can, by using the most rigid economy, get it done for about 8 cents per cubic foot. No less. Those are the minimum figures. The chances are 100 to 1 that you will want a little better trimming, some extra plumbing and this, that and the other thing, that will increase any of these figures at least 12 per cent. So that if any speculative builder, or architect, or anyone else, tries to talk you into starting a house on the promise that it is only going to cost so much, for so many rooms of this and that size, figure it up for yourself and if the amount of expenditure don't come up to what your cubic contents multpilied by these figures add to, you are perfectly safe in telling the man, whoever he may be, that he is either fibbing or does not know his business. Don't allow yourself to be beguiled with any false promises, and if you do decide upon building a house, then, ladies, show good sense and build it fireproof. A brick and tile building is not only fireproof, but verminproof, warmer in winter and cooler in summer, costs far less in repair than a wooden house, lasts infinitely longer—for it is indestructible—and is a joy and consolation every day you live in it.

HOUSE "G"

Verbum sat sapienti. Vade in pace.

HOUSE "A."

These sketches are the rough studies for the plans of a fireproof, $8,000 house in Portland, Ore. The size of the rooms is marked on each. "A" is the entrance porch—cement floor, concrete steps, etc. "D" and "C" are the reception hall and library, or living room. "B" is the parlor and "E" the dining room. These rooms communicate by sliding doors, so that absolute privacy can be secured in each. "F" is the kitchen and "G" the pantry. "S" is a fixed icebox, enameled-brick lined. "T" a coat closet, "V" a little conservatory off the dining room. "W" a back open porch and "X" a lattice-enclosed porch. People will keep baby carriages, lawn mowers, etc., on a porch, so might as well give them a place to do it properly. "H" is the stairway. It is an iron stair, enclosed in tile partition with self-closing doors, and the sash in the doors, giving light into the hall, "C," is filled with wired glass. These people are sensible and are willing to forego the delights of a draughty, dirt-communicating and dangerous in case of fire, but elaborate, open, ornamental stairway. Thus closed off there is not the slightest possible danger of fire communicating from story to story. This stairway serves all purposes. There is access to it from the pantry; it also goes on down into the basement. There is a landing at the ground level, so that the boys may come in that way and go up to their rooms without tracking dirt all through the house. The second floor shows bedrooms at "I, J, K, L," with closets at "M" linen and trunk closets at "T" and "R," bathroom at "Q" with separate closet—a great convenience—at "N." In the third floor or attic there are two rooms for boys, a trunk and storage room and servants' quarters, and in the basement there is a laundry, a furnace room, coalbins and a workshop.

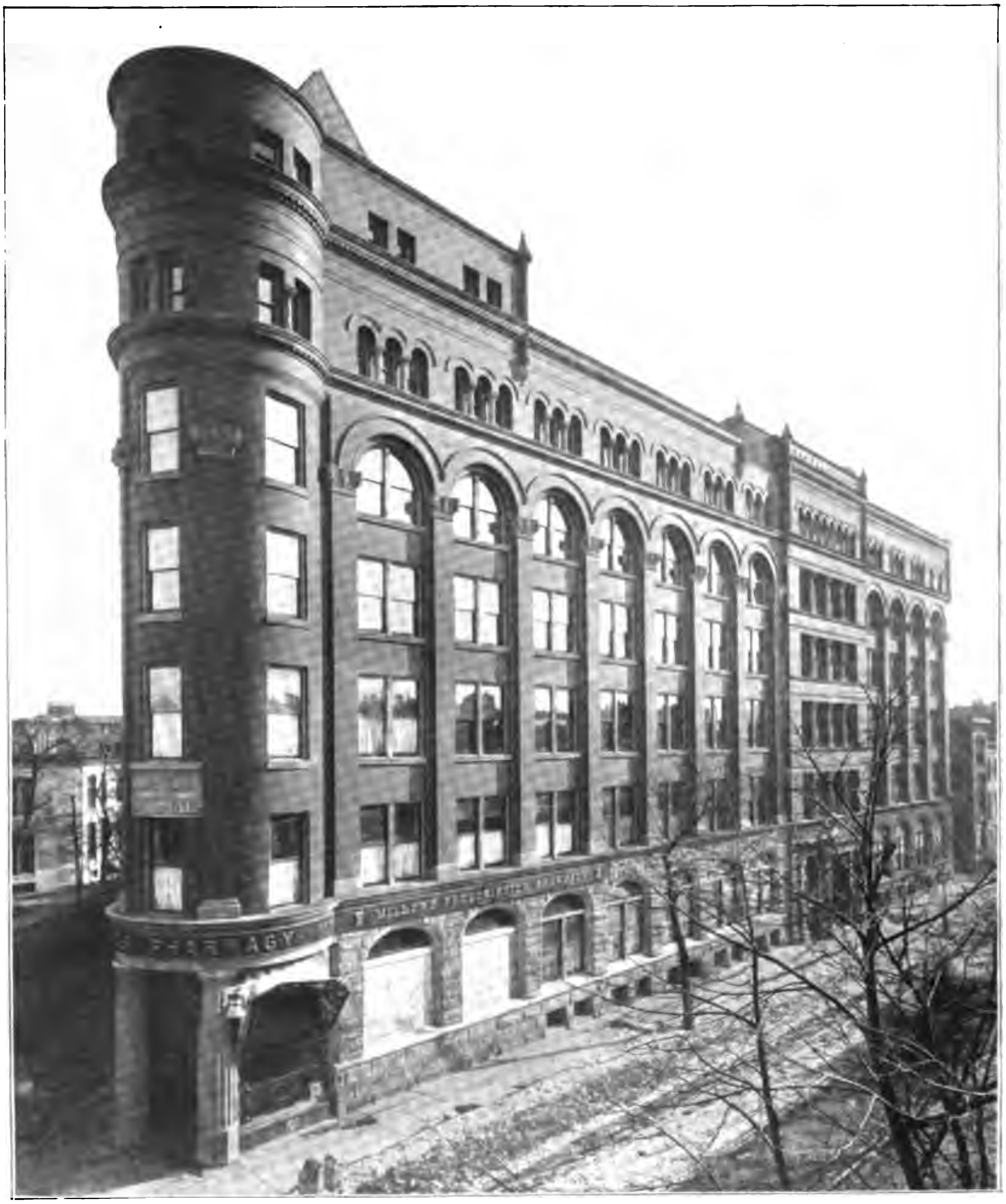
HOUSE "B."

Entirely covers a lot 25 feet front, 100 feet deep, backing on an alley. Some light is obtained in the upper stories on the left of the plan by having windows in the party wall above the adjoining residence, while on the right there is a very fine residence shown on the ground-floor plan at "P," with an automobile house in the rear at "O." The arrangement of this adjacent house is such as to permit of very good lighting of this new residence on that side, and arrangements have been made with the owner so that the conservatory on the first floor at "S" overlaps the lot and is attached to the other man's wall where there are no windows. The ground-floor plan shows the entrance at "A," Mr. H.'s library and office at "B," reception room at "C," hallway at "E," coat closet at "F," passenger elevator at "D," kitchen at "L," dumb-waiter at "K" and closed stair at "J," wine room at "M" and a room at "I" that is used ordinarily for the servants' dining room, but on extraordinary occasions as a gentlemen's dressing room, while room "H" is used ordinarily for Mr. H.'s stenographers, and, in extraordinary cases, as a ladies' coat and dressing room. "G G" are toilet rooms off of these rooms. First-floor plan shows the grand drawing room at "T" and the dining room at "R," conservatory at "S," serving room at "L" and breakfast room at "Q." Elevator at "D" and stairway at "J." Some indication of the ceiling treatment is shown on plan. Second floor shows family sitting room lined with bookshelves at "X," Mrs. H.'s sewing and writing room at "W," day nursery at "U," with the two young gentlemen's rooms at "V V" and bathroom at "G," with shower, etc. Third-floor plan shows Mrs. H.'s bedroom at "V-6," Mr. H.'s at "V-5," with private bathroom at "G," shower, etc., nursery room for baby twin boys at "V," nurses' room at "V-2" and rooms for two little girls at "V-3-4," closets at "F," bathrooms at "G," elevator "D," dumb-waiter "K" and stairs at "J." Fourth floor shows the young lady's room at "V-10," with private bathroom "G," guest chambers at "V-7-8-9," billiard room at "Y." Fifth-floor plan shows housekeeper's and butler's rooms at "V-11-12," bathroom at "G." "Z-Z" ordinarily gymnasium, but also used as ballroom. "G-2" is a plunge and shower bath. The stairs, dumb-waiter and passenger elevator are not only enclosed in fireproof partitions, but also have automatically self-closing doors, so that there is no possibility of fire communicating from story to story. Plus all this, Mr. H., who has been burned out three times in his life, has a fire escape at "N." All the windows at the sides and back of the house are of metal sash with wire glass, and apart from the furniture in the house there is absolutely nothing in the construction that is combustible. The exterior shows a very plain, but rather impressive front, not overornamented, and a house that carries the idea of solid dignity and repose rather than any ostentatious display of wealth.

HOUSE "C."

Is one of a row of eight houses for Philadelphia. They are 20x75 feet. They will cost about $7,500 each, will be rather nicely finished, absolutely fireproof in construction and will rent for about $70 a month. One enters at two steps above the street into vestibule "A." To the right there is the man's library or smoking room. At "C" is the reception hall, "D" is the stairway, "H" the kitchen, "F" the pantry and "G" servant's room. The lot falls away to the rear, so that there is a sub-basement, accessible by stairway "E" and in which will be the heating plant, laundry, servant's bath, coal, etc. The second floor has double parlors, "N N," on the front, dining room at "L," serving room at "F." The dumb-waiter, "J," serves all the stories in the house, carrying meals in case of sickness to the upper stories and convenient for other household purposes. The partitions around it are fireproof, and it is closed with an automatically self-closing door at every story, so that there is no danger of fire communication by that means. The stairs at "D" are well lighted, but enclosed in a room by themselves and with a self-enclosing door, and offer no means of communication of fire from story to story. Note how they are placed so as to serve all the purposes of the house; no need of back stairs. Note also that at "K" are guides on the walls and a platform elevator, geared to a block and tackle on the roof and worked by hand-power. In the hallway on the first floor and all the other stories by this freight elevator is a window opening, full size, a French sash, and the idea is that in moving furniture or other heavy things there is no lugging up-and-down the stairs. A piano or other bulky piece is carried along the level from the front door, put onto this platform elevator and hoisted up to the story desired and there carried out on the level without much ado. The third floor has bedrooms at "P, Q" and "R," with closets at "O," "O" and bathroom at "S." "P" or "R" may be used as sitting room or sewing room, or nursery, for that matter. The fourth floor has four bedrooms "Q, Q, Q, Q," closets at "O" and a bath at "S." The stairs go on up to an attic that can be used for storage purposes. The space for the freight elevator hoist "K" is so arranged that some time the the owner will install an electric passenger elevator. Building a wall at the back will be all the change necessary in construction.

Editor's Note.—The three footnotes above given were too long to introduce in the pages referred to without disturbing the proper distribution of the illustrations.



AUGUSTANA HOSPITAL, CHICAGO

L. G. Hallberg, Architect

A NEW FIREPROOF HOSPITAL IN CHICAGO

L. G. HALLBERG, ARCHITECT.

The board of managers of the Augustana Hospital at Lincoln and Cleveland avenues, Chicago, have accepted within the month the completed fireproof structure of the new addition.

Unusual attention attaches to the work because of the thoroughness with which the fire-resisting structural features have been carried out and the introduction of a harmonious combination of practically every approved modern device and apparatus in hospital equipment.

The new building occupies the triangular corner formed by the intersection of the streets named and presents a corner frontage something similar to that of the Flat Iron or Fuller building of New York. Six full stories in height, with a basement and sub-basement, the walls are of heavy brick specially built to enclose in all of the divisions the 12-inch openings for air ducts, the wall sections proper being 8 inches in thickness.

Floor arches throughout are of porous hollow tile, averaging in span from 5 to 7 feet—10 inches in depth.

The I-beams and bottom flanges are heavily incased with the same protective covering.

Throughout the entire building there is observable an almost total elimination of wood. All floor surfaces are cemented and the corridors and clinic rooms as well as the operating room floors are done in flake mosaic of marble chips.

No iron is employed in the stair construction—the steps being imbedded in and carried by the supporting walls, which sustain them.

On the first floor, covering an area 124 by 88 feet, are situated the reception rooms, administration offices, the hospital drug store, examining rooms and laboratories.

Above this the second and third floors contain the private wards, eight in number—toilets, baths, lockers, etc.

Private rooms occupy the fourth and fifth floors, thirty private apartments in all, with ample corridors, baths and the necessary adjuncts to perfected hospital service.

The upper story, the sixth, is devoted to the operating department, and exclusive of the amphitheater five separate operating and recovering rooms for the accommodation of private patients preferring special medical or surgical care. The main operating room just referred to occupies the corner space running 28 feet in length by 24 in width, lighted from above through a specially built skylight construction 11 by 11 feet.

In this room the wainscoting is of fine Italian marble facing the walls and running up to a height of 9 feet. The effect is one of bright polished cleanliness, of spotless beauty of finish and a delightful contrast to the dim and melancholy aspect of the old style treatment.

Here as elsewhere in the Augustana, the floors are finished in marble mosaic, as is also the gallery, raised platform, and the visitors' benches.

Peculiar arrangement for the artificial lighting of this section includes attachments for both incandescent electric and gas, so disposed as to afford a perfect illumination of the operating table without obstructing the view of the gallery above. The elevator enclosure is of solid brick with solid fireproof doors at each of the separate stories.

In reference to the partition work, Mr. L. G. Hallberg, achitect of the new Augustana, called attention to the placing and arrangement of the bath rooms, which have been so disposed as to meet the needs of patients to the best possible advantage, the tile partitions themselves affording a totally soundproof quality, specially desirable where silence and isolation may prove indispensable to recovery.

Upon this and other material considerations it was decided by both management and architect to employ tile as against either concrete or wood, and the result is considered a vindication of the choice determined.

Considerable discussion has arisen as to the insurance advantages of steel-tile construction of standard fireproof quality.

In the case of the Augustana, the Chicago Board of Underwriters has allowed a special concession rate of 20 cents on a structural valuation of $120,000, the advantage lying not less with the owners of the property than with the insurers in the acceptance of a low premium rate on an especially desirable risk.

Extreme care has been exercised in the building of the Augustana Hospital to provide absolutely fresh air to each and all of the two hundred-odd apartments of the new addition.

Both direct and indirect heating systems are employed. The fresh air conveyed from the in-takes on the Cleveland avenue exposure is specially treated before delivery through the corridors and rooms; it is literally screened, washed and dried before entrance into the interior and the temperatures adjusted with absolute precision. To effect this condition, which is a vital one in hospital economy, an elaborate series of fans, suction devices, etc., have been installed, which insure an invariable supply at fixed degree winter and summer.

Dr. A. J. Ochsner, surgeon in chief and an operator of international celebrity, is justly proud of the Augustana. "Our new operating room," said he, "is the finest in the West. We have left nothing undone which modern science enables us to do for the safety, care and comfort of our patients."

Mr. Hallberg's contribution architecturally to the high standard of modern hospital construction is a considerable one, and as meritorious as it is extensive. The Augustana will stand for years as an exponent and expression of much that is best in building work of this character, to the credit of its builders, no less than that of the city of Chicago, and the comparative advantage of those whom misfortune brings to the doctor's tender care.

STRENGTH OF CONCRETE

While concrete is one of the oldest structural materials, it is a material of which we really know very little in a positive way. It is also the material of all others regarding the use of which formulæ are elusive and by no means reliable. The strength of concrete is seriously affected by at least a dozen varying factors. The amount of water, the size and character of the sand and of the stone with which it is compounded, the character of the rock from which the cement is made, the amount of free lime or plaster which is added to the cement before it is put upon the market, the nature of the burning, the fineness of the grinding, all these so vary as to render the results of tests of one batch by no means a sure guide of the action of cement from the other, and most vital of all is the care, or carelessness, which is used in the mixing. It requires constant watchfulness on the part of the foreman, and a degree of willingness on the part of the mechanics seldom found, to produce a uniform quality of concrete which can be depended upon without reserve for floor and column construction.—The Brickbuilder.

MINIMIZING THE ELECTRIC FIRE HAZARD

BY GEORGE E. WALSH.

THE introduction of electricity into modern buildings has tended to increase the fire hazard, but it is possible under proper conditions to minimize the danger so that it is a small factor in the insurance question. A review of the fires for the past year by the surance underwriters indicates that electricity in its various forms is responsible for quite a large percentage of damages by fire, but in the majority of cases they were easily avoidable and were due to improper wiring, inferior material or ignorance on the part of those using the electric service. The chief causes of these fires were from grounding, short-circuiting, destruction of insulations or defective wiring, or from crossing of telephone, telegraph and other signal wires with power lines. The burning out of dynamos, the improper use of electric lamps, and short-circuiting of flexible cords were also responsible for a number of conflagrations.

In nearly all of these cases carelessness on the part of the users of the electricity and improper wiring and the employment of defective material were the chief factors. So far as the first is concerned there should be no room left for accidents due to carelessness of users. The wiring, material and engineering part of the electrical equipment should be so perfect that anyone totally ignorant of the danger of electricity could not cause trouble in the ordinary use of it for heating, lighting or automatic power. It is this comparative freedom from danger in the hands of the most ignorant that has recommended electricity for general use in fireproof and other buildings.

The question of the grounding or short circuiting due to the destruction of insulations or defective wiring is one that requires careful study and rigid enforcement of rules. The chief trouble in this respect appears in the employment of inferior electricians to equip a building with electrical apparatus. The telephone and telegraph companies are very careful to install their wires in the most satisfactory way, for short-circuiting and grounding causes loss of work and entails a good deal of expense. Frequently the trouble is due to the wiring for call bells and for other secondary uses. The current is not strong enough in these wires to cause trouble, but the danger of crossing with more powerful currents from outside is quite apparent.

The telephone companies have three protective methods for preventing fires from their wires. These are intended to protect the instruments as well as the building from foreign currents which may at any time get crossed with the telephone wires. The first protection is a fuse made of alloy contained in a tube of vulcanized fibre. Should a current of seven to ten amperes run through the wire the fuse would deflagrate or burn out rapidly and break the circuit. The second protective method is to attach a pair of small carbon blocks to the telephone circuit and to the earth, the two being separated by a thin sheet of mica, with a portion cut away and the surfaces exposed to each other. A small button of solder fills a cavity of one of the carbons, and as this melts at 165 Fahrenheit, a strong current of electricity would instantly melt it and pass from the telephone to the ground. This would relieve the telephone of any tension exceeding 350 volts. A third method for protection against currents too small to operate the tubular fuse consists of a heat coil made of fine German silver wire, and forms a part of the telephone circuit. It is heated by a current of one-sixth of an ampere to a temperature sufficient to release a conductor which will automatically ground the circuit.

In addition to these protective methods, which always interfere with the working of the telephone, the electricians equipping a building with signal lines must display unusual skill in placing the wires so no crossing or short-circuiting may follow from the lighting or power lines. Where the telephone or telegraph wires cross high-tension wires, the latter are generally placed above the crossovers, and in such a way that contact is impossible, and also so that the high-tension wires could not touch the telephone lines in the case of a break. Placing wires underground has practically eliminated danger of crosses outside of the building, and the proper equipment of a modern structure with low and high tension wires should not introduce any particular element of danger. It is all in the way that the wiring is done.

Power wires for feeding dynamos operating electric elevators carry sufficient current to jump a considerable distance if the insulation is broken or defective. The question of insulation is a delicate one with electricians. The high cost of rubber in insulation has naturally led to the employment of many cheaper substitutes. The best Para rubber, like copper, seems to advance in direct ratio to the extension of the electrical industry. A good deal of defective insulation is therefore used, which under a little stress weakens and breaks down to the great distress and cost of owners of buildings. Good insulating material must possess a number of virtues that are not always appreciated. It must be non-inflammable, non-meltable, except at a very high temperature, and of enormous resistance power to passage of current. Mechanical stress, workability and flexibility are qualities also needed to make insulating material of value. Artificial insulating material is made to-day that is unaffected by a temperature of 1,500 and more degrees, and it is only slowly dissolved by a strong blast flame or by the application of some powerful acid. It is also comparatively free from metal oxides and similar impurities that would cause disintegration. Its dielectric strength is also very great.

The question of making and using good insulating material for all kinds of electrical equipment is not one of secrecy or of great difficulty, but largely a matter of paying for the right material and using it, even though expensive. In most of the compounds employed for insulating wire and flexible cords, the intrinsic merits depend upon the amount of good rubber used in them. The real test of the insulation of wires comes when they are wet or have been soaked in water for a number of hours. The insulation that will then retain its resistance power is certainly to be commended.

In modern buildings the wires are supposed to be protected from dampness, and one of the laws enforced in equipping buildings is that the wires shall be kept away from steam pipes, pumps and water pipes, so that in the event of a leakage the dampness will not reach the wires. A good many of the cheaper insulations will show up pretty well in a preliminary test, but their power of endurance is limited. They break down within a surprisingly short time and cause grounding and short-circuiting. The cheaper grades of rubber are used so extensively now that builders cannot be too insistent upon the quality of the insulation of every piece of wire installed. Most electrical engineers to-day insist upon contractors furnishing certain specified quality of Para rubber for insulating wires that are to come in contact with any part of the building. It is only by living up to these conditions that immunity from fire can be obtained.

Likewise the fires started from dynamos and burnt-out armatures are preventable through the application of the right principles of construction and equipment. To intimate that it is impossible to eliminate the fire hazard in this respect is to imply that electrical engineers and contractors have not kept abreast of the times in their specialty. Within three months, more than a dozen fires were started from imperfectly installed dynamos and motors. Whether these dynamos were used for operating electric elevators or for driving engines or other power machinery matters not; their installation could easily have been made so as to prevent fires.

There is only one method of assuring complete immunity from fire hazards in this respect, and that is by having the floor of glass and then covering it with rubber mats. The dynamo room in the basement of a building thus equipped is practically proof against accident from burnt-out armatures or defective motors and dynamos. Not always can the manufacturers of motors and dynamos calculate upon the perfect action of their machines at all times and under all conditions. A leak in a steam pipe or water pipe so that the water trickles through and reaches the coils of the armature may cause burning out which is sufficient to start a fire. If the dynamo and motor are insulated by the glass floor and rubber matting, the burning out of the field coils will cause no conflagration. The sudden burst of flame will end and the current cannot get short-circuited in the wood, steel or masonry work around. The cost of equipping the building with a glass floor is an extra item of expense, and for no other reason contractors will fail to put them in unless specified particularly. There are several hundred dynamo rooms thus equipped in the large office buildings, and in not one of these structures has a fire ever started from this source, although a number of cases of burning out of the field coils have been reported. A building cannot be considered absolutely fireproof unless its dynamo room is thus protected by absolute non-conductors of current. Besides protecting the building, such precautions tend to reduce the death hazard among the engineers and operators

In the protection of buildings from fire by electricity, the question of the power of ordinary incandescent lamps has quite recently been brought up for discussion. The installation of such lamps has too frequently been made with the belief that they were practically safe. It has been demonstrated in a series of tests, however, that the incandescent lamp is a source of danger if improperly used. Wrapped around by paper, it will ignite the inflammable material within an hour or two. Even silk and woollen shades for the lamps have been set on fire within a few hours. If the hand is held long enough on the lamp it will get severely scorched and burnt. The general impression that fires could not start from the incandescent lamps is due to the slow, gradual heat omitted therefrom. The hand is not burnt when placed against the lamp, but the heat is steady and penetrating. In time it will cause ignition. For this very reason the use, or rather the misuse, of paper and cloth shades for electric lamps should be discouraged, and the true danger made known. The protection of the lamp by an outside globe of glass limits the danger element, and it is a question whether naked lamps within the reach of users should not be prohibited.

The flexible cord for lamps has come into such general use now in offices and homes that it reaches the dignity of an important factor in the fire insurance question of the day. Such flexible cord, unless made of the best insulating material, offers a weak point which may any day cause fire. On the other hand, the abrasion of the cord against metal pipes may in a short time wear off the insulation and produce short-circuiting. A number of fires have been traced to this cause within the past year, and with the increased use of such cords it is possible that the conflagrations due to them will rapidly multiply unless precautions are taken. Where the cords emerge from metal sockets, the abrasion is most noticeable, and also where they are wound or tied around metal supports. A light attached to the ordinary home chandelier might easily cause a fire through short-circuiting. If the flexible cord hangs in a loop from the brass chandelier, a slight break in the insulation would cause the current to burn out the bracket and start a fire in the ceiling.

A good deal of time and money have been spent in the past to protect buildings from lightning, and yet statistics show that the number of fires started from lightning is small indeed to those caused by defective wiring and insulation of buildings with electricity for telephones, lighting, heating and power. It is doubtful if absolute protection from lightning can be obtained. All that engineers can do is to employ reasonable precautions. The use of lightning rods has steadily gone out of fashion, and fewer buildings are being equipped with them than ever before. It is intimated by electricians that the modern high tension trolley wires, telegraph and telephone wires protect the buildings better than the old lightning rods. They receive the current which formerly struck the buildings, and, owing to the precautions adopted by the companies, the current is quickly grounded and rendered ineffective except for the burning out of a few fuses and switch boxes. The character of the building makes a difference in its immunity from lightning, and various structures demand different treatment for protection. The last report of the National Fire Protection Association indicated that a considerable loss could be avoided by the proper installation of protective apparatus, but it did not go into the details of how that protection should be obtained. It is still a question open to many doubts and misgivings, but the total loss is sufficient to warrant the application of the best materials and equipments to buildings for their protection from lightning.

PICKLING STEEL

The Building News (Baltimore) says that the pickling of structural steel was probably first done in this country in connection with the steel flooring of the Williamsburg bridge, in New York city. The specifications for the 12-inch channels on which the paving blocks are carried required them to be cleaned and painted with pure linseed oil while still hot from the rolls. When it came time to execute the work these specifications were changed so as to permit the metal to be cleaned in pickling baths, which has long been done to a considerable extent in Europe. In the case of the channels for the Williamsburg bridge the shapes were first boiled in a 10 per cent solution of caustic soda to take off the grease. Afterward they were dipped into a boiling 10 per cent solution of sulphuric acid until all the oxide was removed. After being rinsed in boiling water they were dipped into a boiling 10 per cent solution of carbonate of soda to free them from any trace of acid. Finally, they were rinsed in boiling water, dried over steam pipes and then treated by the Sabin process of enameling.

FOREIGN CORRESPONDENCE

EMERGENCY CURTAIN FOR THEATERS

Hannover, January, 1905.

THE chief of the Hannover fire department, Herr Reichel, who was the pioneer in introducing automobile fire-engines with absolute fuel and with tenders for coal, has invented (but does not intend to patent) an emergency fire-curtain for theaters that are already provided with an iron drop-curtain. The object of this second or emergency curtain is to provide protection for the spectators in case a fire breaks out on or back of the stage and the regular iron curtain fails to work, as happened in the Iroquois disaster in Chicago. The "emergency" curtain can also be used to supplement the regular fire-curtain and accord additional protection, if only temporary. The main thing for it to accomplish is to prevent the flames and smoke from penetrating into the auditorium until the spectators are out of the building.

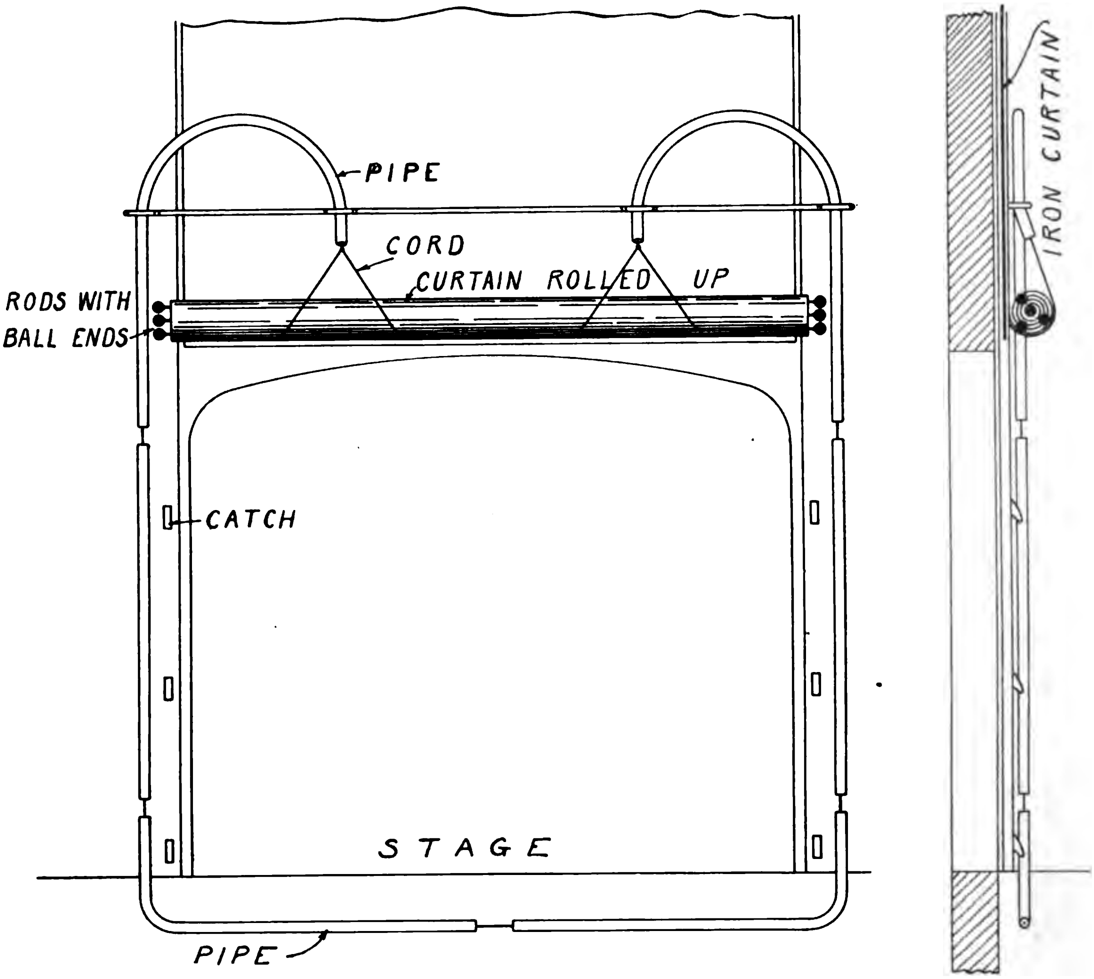
With reference to the accompanying illustration: V V represents the emergency curtain in a rolled-up condition, above the stage opening. It consists of asbestos or other fireproof material suitable for such curtains, but is attached to or combined with a system of vertical wire cords and stout horizontal iron rods. The curtain bears no part of the weight of the horizontal rods, as these are independently carried by the wire cords, which are attached to the upper and the lower curtain rollers and rolled-up with the curtain itself. There are about five of these wire cords to support the rods for an ordinary stage-opening width. At each end of each iron rod there is a metal ball. When the curtain is lowered, either slowly or rapidly, these balls engage in the catches, K, so that, although there might be a strong draft from the stage toward the auditorium, it would not be able to blow the curtain out into the latter space, or even belly it outward.

As these rods could be only in tension when thus resisting the draft from the stage outward, they need not be of very great diameter. The curved pipe-line through which is led the endless cord that holds up the curtain has in its length several gaps at convenient places; and by each of them there is chained a stout, sharp knife, with which to cut the cord in case of fire. Of course, cutting the cord at any one point suffices to let the curtain (and with it, naturally, the cross-rods) down with a run, covering the entire stage opening from within, and effectually cutting off communication of smoke or flame between stage and auditorium. There is no complication about the device. If the cord is cut anywhere in its length, the curtain must be released; the weight of the lower roller, together with that of the curtain, suffices. The curtain is rolled up by the use of inclined ladders, boards or poles, as may be convenient.

About once a year the device is tested, not by cutting the cord, because simply loosening one of its fastenings would do as well, and the curtain is let roll down on the inclined ladders or rods on which it is to be rolled up again. The object of the testing is simply to see if the stuff of which the curtain is composed is in good condition. There is naturally nothing to prevent the cords and the curtain from being tested monthly, or even weekly, if desired; there is only the trouble of running the cord through the tube line, an affair of about fifteen minutes.

ROBERT GRIMSHAW.

NOTE BY THE EDITOR.—It seems as if such a device, which certainly would not be very expensive, might be adopted in the smaller cities where there are no drastic ordinances requiring the installation of steel curtains.



Emergency Curtain for Theaters.

CONCRETE FLOOR BEAMS AND FIRE RESISTANCE

(From the Builder's Journal, London.)

HOLLOW concrete beams reinforced with iron rods and laid side by side so as to form a floor have recently been put on the market in Europe, and among the advantages ascribed to them are those of "fire resistance."

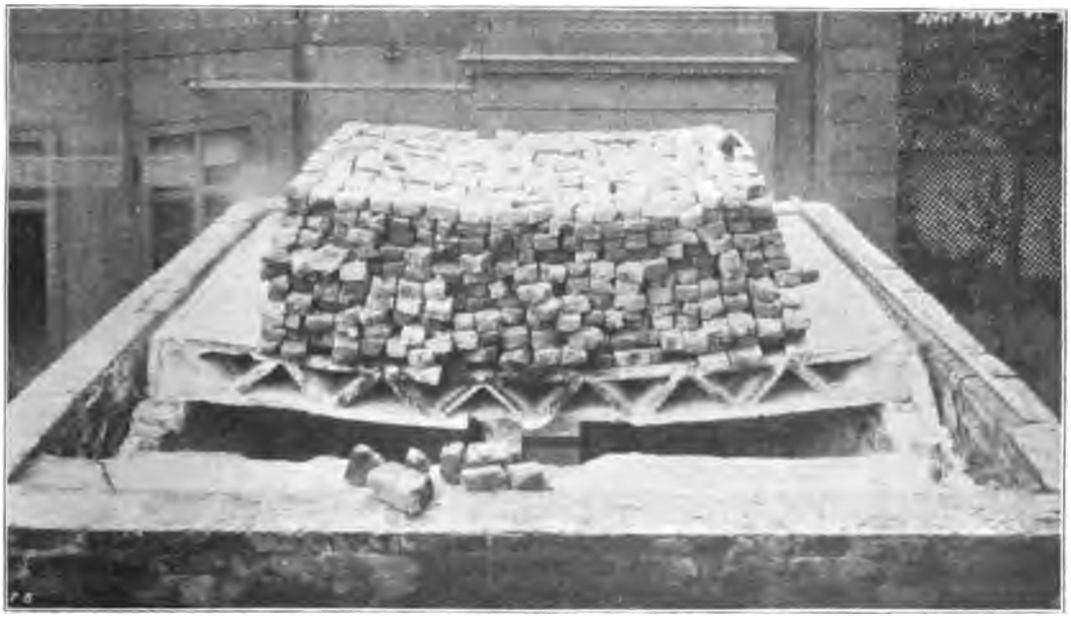
The question of concrete hollow beams is becoming such an important one that any advocacy as to their possible resistance against fire requires investigation before the description of "fire resisting" is accepted as a fact. We are glad to observe from the report of the British Fire Prevention Committee issued last year that they have taken this matter up and have tested such hollow beams with the view of ascertaining the truth.

We have before us Publication No. 78 of the committee, which deals with a floor of this description, and we reproduce verbatim the "object of the test" and the "summary of the test," together with two photographs out of the report. We think the "object" and "summary," read together, speak for themselves, more particularly when illustrated by the photographs. But we desire to take this opportunity of also pointing out the lesson to be learned from the test in question. It is obvious to all who have followed the series of independent fire tests conducted by the committee that armored-concrete floors must show considerable resistance against fire, but only if the metalwork—in the form of rods or wire—is sufficiently protected so as to prevent expansion when the heat is applied. In designing an armored concrete floor or girder the designer tries to put his rod or wire as low down as possible, and forgets that by doing so he reduces the depth of the concrete which has to protect that rod or bar from expansion. Designers in ferro-concrete, armored concrete and the like should make it an absolute rule that, so far as floors are concerned, no metalwork of any kind should be within 2 inches of the soffit of the floor. Otherwise the term "fire-resisting" will be a misnomer and the results of independent tests will be as in this instance.

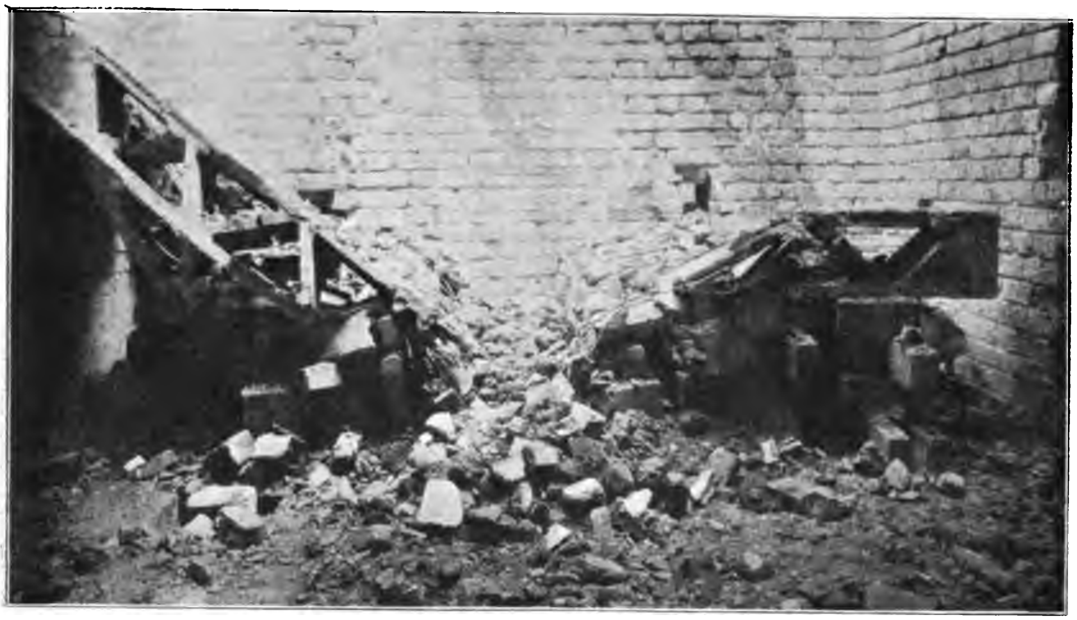
OBJECT OF TEST.

To record the effect of a fire of two hours' duration gradually increasing to a temperature not exceeding 2,000 degrees Fahr., followed at the end of two hours by the application of a stream of water for two minutes, and the consequent rapid cooling.

NOTE.—The area of the floor under investigation to be 100 feet superficial in the clear (10 feet



A SWISS FLOOR OF HOLLOW CONCRETE BEAMS AFTER A 100-MINUTE FIRE TEST.



RUINS OF THE HALF THAT FELL

by 10 feet). The load to be carried by the floor was 224 pounds per foot superficial.

SUMMARY OF EFFECT.

After *65 minutes* the floor began to sag and continued to sag.

After *100 minutes* about one-third of the floor collapsed with a portion of the load.

The remaining portion of the floor remained in position, and was sagged in the center about 5½ inches.

On the application of water the soffits of the beams, where struck by the water, were to some extent washed away.

NOTE BY EDITOR.—The construction above referred to was a Swiss invention. It evidently had been submitted with the hope of its introduction in England.

AN ENGLISH INSURANCE SURVEYOR'S OBSERVATIONS ON FERRO-CONCRETE AND FIRE TESTS

James Sheppard, A. I. E. E., insurance surveyor of the North British and Mercantile Insurance Company, contributed to the *Builders' Journal* for December the following observation about reinforced or ferro-concrete systems of construction and fire tests, which had been suggested by the reading of a paper by Mr. Mouchel before the Royal Institute of British Architects.

Reinforced or ferro-concrete systems of construction, although especially suitable for use in the erection of fire-resisting buildings, do not supply any new principle for protection against the action of heat; therefore precautions shown by experience to be necessary to secure fire-resisting qualities in other methods must also be observed when erecting buildings with these newer systems, if protection against the action of fire is required.

The precautions referred to are now well known, being chiefly:

(1) The use of incombustible materials that do not change to any important extent under the action of fierce heat and sudden cooling by powerful streams of water and of careful workmanship properly applied.

(2) Complete encasement of all constructional metal, with a non-conducting fire and water resisting substance not less than 2 inches in thickness, secured so as to retain its position under the action both of great heat and streams of water.

(3) Limitation of buildings, or their securely separated compartments, to a moderate area and capacity, regulated by the nature of their contents.

(4) Protection from fires that may occur outside the fire-resisting building.

It will be a great misfortune if, by taking liberties with these new systems of applying materials they become discredited, as is now the case with earlier forms of so-called "fireproof" structures, which practical firemen have found, when their contents are freely burning, to be the most dangerous and difficult buildings they meet with.

The importance of these precautions was shown in the case of the Fidelity and Guaranty Company's building, No. 111 East German street, Baltimore, involved in the conflagration of February last. Part of this building, having basement, four stories and attic, covered a ground area of 1,700 feet superstructure, was constructed in ferro-concrete, broken granite being used for the aggregate, with the result that exposed angles of the concrete in piers and beams where subject to considerable heat split off, exposing long lengths of the metal reinforcing rods.

With a continued high temperature, which may be the case when the stories of a building filled with combustible goods take fire, the tensile resistance of the metal would be seriously weakened, leading probably to collapse. The action of the concrete under heat also showed that better results would be obtained by rounding off all external angles in place of finishing them with a sharp arris.

SOME TESTS DESCRIBED BY MR. SHEPPARD.

In March last a fire test was made in London of a box formed ten weeks previously in ferro-concrete by Messrs. Cubitt to instructions furnished by Mr. Mouchel. The box alone enclosed about 5 cubic yards; two of the sides were 4 inches and 6 inches thick. There was no floor to the block, the sides of which rested on brick walls 3 feet high; the top or ceiling of the box was 4 inches thick, with a beam projecting 6 inches below the underside and 4 inches wide. This arrangement gave a space of about 9 cubic yards; this space was nearly filled with wood and shavings, which were set on fire, vent holes being provided in the upper part of one side of the box. The concrete used was composed of screened Thames gravel varying in size from ⅛ inch to ¾ inch, sharp sand and best Portland cement very finely ground. The top of the box was loaded equal to three cwts. per foot superstructure.

A fire was maintained inside the box for 45 minutes, the maximum temperature to which the concrete was subjected being probably not more than 1,200 degrees Fahr. About 20 minutes after the fire was started cracks appeared on the outer face of the concrete on all sides and also on the top; in some parts these cracks were ¼ in. wide. On the box being cooled by streams of water an examination was made of the inside, portions of which had been finished with a coat of cement plastering. Most of the plastering was found to have flaked off, the face of the concrete being spotted in places by the splitting of pebbles or flints composing the aggregate. Slight air cracks corresponding with the wider cracks on the outside could be seen, but generally the inner face of the concrete was less affected than the outside, with the exception of the splitting of pebbles and flints referred to.

"The reinforcing rods varied from 3-16 inch to ¾ inch diameter, with stirrups of ⅞ inch hoop-iron of 19 B.W.G. The thickness of concrete from its surface to the metal rods varied from ¾ inch to 1 inch. The heat could not be continued for a sufficient time to subject the rods to a reliable test. It has been suggested that the cracks in the concrete may have been caused by settlements in the brickwork, but in this case they would have passed through the concrete and be chiefly restricted to its outer face.

In August, 1903, a fire test was made by the British Fire Prevention Committee of a Swiss floor formed with reinforced trussed hollow concrete beams placed side by side. Five-sixteenths-inch iron reinforcing rods were embedded in the concrete, which was composed of sand and Portland cement 3 to 1; the thickness of concrete from its surface to the metal rods was about ¾ inch. The floor was loaded equal to 224 pounds per foot. When the temperature had reached 1,940 degrees Fahr., to which it had been raised from 64 degrees in 105 minutes, five out of the fifteen beams included in the test collapsed.

NOTE BY THE EDITOR.—We print on pages 109 and 110 a detailed account of the last mentioned test, with illustrations, from the *Builders' Journal*, London.

BRITISH OPINION ON AMERICAN FIREPROOFING

THE British Fire Preventive Committee has commenced the publication of its "journal," which will hereafter be issued quarterly. It is a large quarto of fifty-three pages, profusely illustrated. The first number, dated November, 1904, is devoted entirely to a description of the Baltimore fire. This "description," which has been so long in appearing, consists of three documents which long since were published in this country: The report of the special committee of the National Fire Protection Association (from which extracts only are used), the report of Capt. John Stephen Sewell, U. S. Engineer to the Chief of Engineers, U. S. A., and the report of the Insurance Engineering Experimental Station, Boston.

A "summary" made up from these reports by Edwin O. Sachs, chairman of the British committee, precedes the above mentioned excerpts. This summary, which is all the wisdom that the British committee is able to devote to such an important event, naturally reflects the opinions expressed in the several reports quoted, and is not the result of any individual investigation. It is conservative, however, like everything else that is British, but of little or no practical value, for it is a reflection in many respects of prejudiced American opinions, which purposely avoided the great fact that the construction of all the high fireproof buildings was saved by terra cotta.

On this subject the *British Clay Worker* (London) had previously said in its September issue:

"We believe that no illustrated accounts have been published up to now in any English technical journal of the huge conflagrations of February last in America. What is the reason of this reticence, and how is it that the truth about these fires has not filtered through into the numerous papers devoted to the architecture and building of this country? Is it that the clayworker has no power in the press, or is he too callous or careless to wish to see the truth brought out? Be that as it may, the fact stands that only one note has been published which does bare justice to the facts, whereas many have been printed giving a one-sided and biased report of the results of the trial by fire of the entire business portion of the city of Baltimore. We publish in this issue the first portion of an account of this fire and that which occurred at Rochester, N. Y., three weeks later. This portion deals with the effect of the fire on the exterior of several of the most important buildings, it being reserved for the next portion to deal with the fireproofing proper of the buildings. The sum and substance, as far as the clayworker is concerned, of the reports published in this country amounts to a condemnation of terra cotta both internal and external. This condemnation is given without any statement of facts or examination in detail of causes and conditions, and we think the descriptions and photographs we publish will convince our readers that not only are the English reports and comments unjustifiable and inaccurate, but that they are purposely calculated to prejudice the architects and the public against a material which not only stands the tests of time and climate, but is at the same time cheap, and has now stood fire also.

"We cannot determine the reason for this one-sided treatment of the case. Surely those who are interested in concrete fireproofing are not so malicious that they wish to extend their prejudices to a condemnation of external terra cotta as well as internal, in order to strengthen their case. External terra cotta suffered, and in some places suffered badly, in this fire, but, apart from the fact that much of the damage was due to faulty methods of construction, careful reports show that the damage was very small and did not amount to more than 10 per cent on the whole on those buildings left standing. Stone, granite and marble were all entirely ruined. Why, then, 'condemn' terra cotta which was only 10 per cent damaged? We claim the result as an immense triumph for the clayworker, a marvelous achievement in artistic work. The heavy projecting cornices of six large buildings practically unscathed after twenty-four hours of roaring, rushing flames! The finest details of carved panels, fluted columns, decorated bands only smokestained! and this result to be condemned, condemned by the English architectural press on the showing of one solitary report by the expert (save the mark!) of an insurance company! We are indeed ashamed of the inadequacy and evident partiality of our technical contemporaries. We are the more ashamed since such beautiful publications have been available since March, as those from which we have been privileged to get our information."

The *British Clay Worker* again came to the rescue in its October issue. After showing a photographic panoramic illustration of the whole group of fireproof office buildings, standing, to all appearance, intact, surrounded by a desert of crumbled walls and rubbish, and presenting four half-tone engravings from photographs taken inside of the Herald building, showing ceilings and floors intact and all else destroyed, it makes these comments:

"To review the whole condition of these buildings after the fire, it must be evident at once that terra cotta saved them both externally and internally, and so far from having proved the lamentable failure described in the English press, was undoubtedly, where properly applied, an entire and unqualified success.

"In the matter of complete fireproofing, these buildings lacked much, but it is not our province to deal with this side of the question.

"Our panoramic view of the 'Burnt Clay Line of Defense' is ocular demonstration of the value of terra cotta, and must confute all statement to the contrary. These buildings saved the new courthouse, and, in all probability, the inhabited portion of the city. In the face of these facts the report mentioned in our last number by Professor Norton is obviously one-sided and biased. He condemns everything in one sweeping indictment and states that terra cotta completely failed in every respect. This report has been published *in extenso* by nearly all the architectural papers in London, whereas the genuine and truthful report of the National Fire Protection Association has been completely ignored.

"We cannot but remark on this obvious injustice to our great industry, and we repeat our protest of last month."

GERMAN TESTS ON FERRO-CONCRETE

BERLIN, January, 1905.

SOME tests on ferro-concrete have recently been made by Professor Rudeloff, of the Royal Testing Office, of Lichterfelde, near Berlin.

In the report just published by the office, the low adhesive strength of iron in concrete is particularly striking and likely to interest American readers. Prisms of ferro-concrete 50 sq. mm. in diameter and containing a reinforcement in the shape of a round iron rod 10 or 5 mm. in diameter were submitted to strength tests. The samples supplied by one firm were said to contain one part of cement and three parts of sand, having laid in the open air during about four years. Now, in two tests made with the stronger iron reinforcements, a strength of only 8.7 and 9.4 kgs. per sq. cm., respectively, was stated (the iron beginning to slide at these loads), while in tests on the thinner iron reinforcements only 3.2 and 3.5 kgs. per sq. cm. were stated, respectively.

Further experiments were made to compare the ductibility of reinforced concrete, with plain concrete prisms, as obtained after removing the iron rod. These experiments had been suggested by the conclusion drawn by Considère from his own experiments, namely, that the ductibility of concrete up to breaking should be increased considerably (up to ten or twenty times the original value) by the reinforcement. This conclusion is shown to be erroneous by Rudeloff's researches, bringing out the fact that iron concrete samples, in order to obtain the same tension, require higher loads than would be inferred by calculation from the sum of the individual loads of the two components, the ratio being about 108 to 100.

The ductibility either of the concrete or of the iron, or else of both of them, thus appears to be lowered by their combination.

A. GRADENWITZ.

A CITY OF TILE AND BEAUTY

A REVERY OF THE STREETS

CHARLES M. MAYERS.

I seemed to be walking along in the depths of a murky chasm—a canyon with walls rocky and clay-like towering on either side. Grim and precipitous they rose and clouds hung about and dimmed their tops. But when the sun sometimes streaked through the line was broken and uneven, but all angular and without the beauty of nature.

The canyon was not deserted. In the dim half light myriads of living things were crowded together and moving like insects—rather like ants—and forming two endless opposite streams, worming their way along, avoiding each other with dextrous step, and all terribly serious in their march onward. And through fissures in the walls and from other canyons that cut in at intervals they still kept coming and "adding their sum of more to that which already hath too much."

Nor was the canyon silent. A ceaseless din, a rumbling, clanging jangle of discordant tones numbed the faculties into almost a seeming silence and left the eyes sole mentor to the sense, as one who witnesses a pageant from a distance or a pantomime.

Suddenly out of the more distant din came the sharp clang of warning close at hand. A glance of challenge, a hastened step and I have passed the danger by. The clanging melts again unheeded into the general din, but it has roused me rudely from my revery. Again I am on the city street. In a flash the canyon fades. Its walls are buildings ribbed with steel; the rock is granite and the clay is tile; the clouds that hang about their tops are smoke; the clangor is the din of traffic and the living things are men.

Even reveries have their uses and I fall to contemplating the buildings and the crowd. They are much alike. How, indeed, could they be different? When were buildings ever anything but types of the people's thought? In the great composite face of this crowd on the busiest streets of the busiest city of the busiest people of the world is written the restlessness, the terrible earnestness, ceaseless striving and all the crudeness, strength and faults of Americanism crystallized.

I look up from the crowd to see its features in the structures they have built. They stand like palisades—like causeways for Titan's tread, forced out of the earth by the hand of man; types of strength; types of solidity; types of usefulness; permanent as nature's castles, but all unbeautiful.

Stories on stories—what does that bring to mind? The Coliseum.

"Arches on arches! as it were that Rome,
 Collecting the chief trophies of her line,
Would build up all her triumphs in one
  dome,
 Her Coliseum stands."

They say the Coliseum looks best by moonlight. Chicago would look best in inky darkness.

My revery has made me look at things as one apart. I travel along contemplating the crowd and the grim buildings which they built and which they people. In that throng is much that is rude, uncouth, unlettered, but not uninteresting. It rather attracts. It is appealing. It pants with humanity. But the incongruity of the buildings stands out in painful relief. Buildings whose structural strength are crowning triumphs of an engineering age are plastered over with travesties on art. Whole blocks that house the brains and genius of the richest, densest district of the world are covered with designs as meaning-less as infant's random stitches on a kindergarten card. No school, no method—nothing expressed unless it be a *desire* for ornament that fits as crudely as the ring that dangles from a kaffir's nose.

Why is it that this city—this country, of which the city is a truthful prototype—with all its superior knowledge, with its facilities for study which have brought to its aid the best accomplishments of every other race and time in material triumphs, has been unable to acquire the beauty of their building art? Why is our architecture not coordinate with our other growth in art? It does not arise from ignorance. A very casual searcher must conclude that we have made a most exact study of architecture as an archæological research. Simple questions of the origin and growth of orders, the influence of invasion and change of conquest have been expanded into volumes. So painstaking and thorough has been this study that it is well known that, like Cuvier and his bone, an authority can build from a fragment the whole structure, recreate the whole architectural ordinance and tell its age, its nation and the growth of thought that brought it forth.

How have we profited by our knowledge of the styles that grew and flowered as each nation's worthiest thoughts took form? What have we gathered to ourselves from the masterpieces of old? The dignified pyramidal style of Egypt, breathing in its repose and massiveness the very atmosphere of that land of "the vast and monstrous;" the Greek, proportioned like the human form, simple yet severe, eschewing the curves of innovation, but with ornament as chaste as the fillets on a maiden's brow; the Roman, adapting the Greek, as truthful in proportion, but building into its domes and arches its eternal breath of triumph; the Gothic, with its pointed arch and design as intricate as leaves and boughs of trees, and which we may perhaps claim as a rightful heritage from savage ancestors; the Saracenic, with its dazzling color, its wonders of restricted ornament, its worthy adoption of both round and pointed arch, column and capital, but with its own domes and minarets that seem built only to lie languid in an oriental haze; what have we gleaned from these? What have we produced but imitations which are not even flattery?

What would some future archæologist say of fragments of the architecture of Chicago? And when I name Chicago I name the country.

"While stands the Coliseum Rome shall stand," etc., and we may paraphrase and say: "As builds Chicago so this race shall build;" and it is not without precedent or reasonable prophesy that we might add: "And as this race, the world."

What can we say upon a survey of the architecture of Chicago? Facades that teem with faults; entrances unbalanced; doorways that yawn like caves; jumbled columns, retiring bases and capitals like misfit hats; domes like warts and towers like the bulging superations of some inward hurt crying for abrasion; topling entablatures; architraves that ache; friezes of sculptured freaks; cornices that shriek out to gravity for a center and occasional caryatidean creatures that would shame a gargoyle into dignity.

Block after block of buildings in Chicago carry out these architectural jests. Exceptions there are, but in such contrast that they seem almost misplaced.

Apart from the paths of common travel, wrapt in the dingness of wholesale trade is Richardson's contribution to Chicago's civic art; and Richardson had the genius to be simple. Massive and plain, the wholesale building of Marshall Field is in design in unity with its use. It shames everything for blocks; but its material is as dingy as its surroundings. Chicago, which owes everything to corporate energy, concedes everything to corporate greed, and the soot of corporate smoke clings thickly on the granite walls.

For the West the Auditorium presents the best genius of Sullivan in ornament bristling in sensuous design. Time was when the Auditorium was Chicago's pride—inspiration to New York. It was the product of a period that knew no limit to achievement, the substance of the mirage that floated briefly as the "White City" in Jackson Park. It stands yet as a monument of promise, but its walls are grimy and its decoration, in rich, gentian-like relief, makes crevices for dirt.

There are other examples as worthy, no doubt, in treatment and design, as these, but they all long ago took their places in the soot-covered line, their faces blackened before they breathed with occupancy.

It seemed to me as I passed along by them a hopeless outlook for architectural beauty. Even where the form and feature is supplied it seemed that the conditions of the city would not let it be beautfiul. Chicago must have smoke—will have it for years to come. If the smoke destroys all present forms of beauty it must seek a solution born from the same energy which now creates its need. It must come from the crowd.

Again my attention is diverted to the people—to the crowd which they compose. It is not like other crowds. It is Chicago's crowd. Men of all races and all conditions go to make it up, all helping to form the same civic characteristics and all intensely American. It is impossible for one to be in it and not of it.

As I scan the passing faces I am struck by what Tom Lawson, speaking of another crowd, calls "its appalling transiency." But is not this transiency only in appearance? Perhaps the crowd is also transient in its thoughts, but out of this transiency must come whatever there is of unity and whatever we may hope for in permanence.

Each of the units of this crowd, I mused, is carrying his own little world of thought. It goes out from him in widening circles and most time they cross with others like those from pebbles in a pool and lose themselves in useless ripples; but sometimes the circles coincide and form a wave that moves things with its force.

And what of the make-up of this crowd; what of its knowledge, its experience, its *desire* for a great scheme of civic beauty, which shall last and be the real permanence when all other things which now supplant it shall have assumed their just value and proportion? Does a hope for it exist? We see in it people from every nation, state and town, and from every condition of life, impressed or harassed by their own affairs, and mostly forced to stifle trains of thought that under favoring conditions might find expression.

In this crowd, motley as it appears, shall we look only to those of native birth for better things? Those who come from other lands in ever-increasing numbers and seem to grasp only the feverish mercenary spirit of the city may well be questioned as promising to add anything to its æsthetic good. Yet is there not in the very spirit which brought them here the greatest hope? Is not the school of travel the broadest one of all? Will not the want of something known at home whet the desire and some time assert itself? Is not the man or child whose mother has lived in a country where art has had time to thrive as likely to add to its contribution here as one of our land-locked countrymen? Has our more general schooling any advantage over his long-absorbed traditions?

My musings have carried me beyond the city's heart—outside the clanking loop of steel that girds it in and ceaselessly pours into it its loads of living freight. I wander down into the district which fringes the city's busiest part and where faces of foreign stamp are oftenest met. My reasoning has satisfied me, but I wish to put it to a test. I step in to see a swarthy friend of mine and question him. I have his confidence and he answers me as best he can by look and shrug and such few words as he can find to fit a question he has not often had to meet. His face brightens as he tells me that he was born in Turin. He is of the peasantry, but has been a sailor and he has seen Naples, Rome and Venice. Does he like Chicago better than the cities of his native land? He answers with a grimace. The business, the independence—yes; but he waves his hand broadly toward the street and says: "All-a-smoke! All-a-dirt!" He points to a row of buildings with narrow stairways and a modern building adjoining and towering above them. He laughs at the dark stairways. The big building impresses him, but not its beauty. And then he tells me about the palaces of the king, the rows of buildings of even height, the wider entrances and the civic cleanliness of the cities of Italy that he has seen.

Unschooled and crude as his description is, there can be no doubt but that there is stamped on his mind the influence of the beautiful examples which he describes, not knowing whether they are types of archæology or renaissance.

And so it must be with others that carry to our cities the knowledge of things they have seen at home and the memory of which does not soon fade. The crowd lacks only leisure. It will as surely assert itself in its characteristics in the buildings of some future time as that it was the destiny of a writer in our tongue to gather together the best gems of poetry and plot of other times and breathe into them new life. In what form this civic character in building will find itself expressed is difficult to guess.

In seeking to solve this riddle of the sphinx-like crowd I find myself again upon the boulevard which skirts the lake. The clank of iron ties gives way to bark of motor cars and clatter of hoofs, and wealth and such refinement as it breeds is passing in review. Marks of culture are on every hand, but mixed with much that is blasé and gross. Not to the ranks of wealth alone can we look, but to that busier, restless throng when it shall in time force its demands for beauty in building, just as it now tolerates the worst.

I pass along by evidences of art in other lines on every hand. Painting and sculpture are represented in studios and galleries that rank among the best; music, in schools, choruses and orchestras, has reached a stage that it would be folly not to call great in its achievement; the drama is housed in worthy halls, interpreted by worthy actors and enjoyed by audiences that know, and libraries, among the best, attest to the study of them all. Architecture alone has not kept pace.

How could it? In a necessary search for new building methods what time has there been for anything else? Have we not had to find new kinds of foundations that will not sink; superstructures that will not topple or crash through; frames that will stand the vibrations and torsion strains of height and walls that will withstand the elements? We have only now reached perfection in this structural work.

If, then, we have found that this cramped, smoke-pestered city presents new problems for which the materials and treatment of other times will not suffice, upon what may we build our hopes for a city beautiful? Towering like a prophetess, the Republic Building rises before me with an answer. Glistening and white, its walls toss back the sunbeams through the clouds of smoke. Soot drifts against the glazing of its tiles, but finds no lodgment. Plain though it is in treatment, it suggests nothing which is not fulfilled. Its promise is far greater. Perfect in structure, provision for every weight and stress and strain an engineering feat, its frame protected and walled with a material that has already been through its baptism of fire, it also offers in its glazed white sides a forecast of a city of tile and beauty.

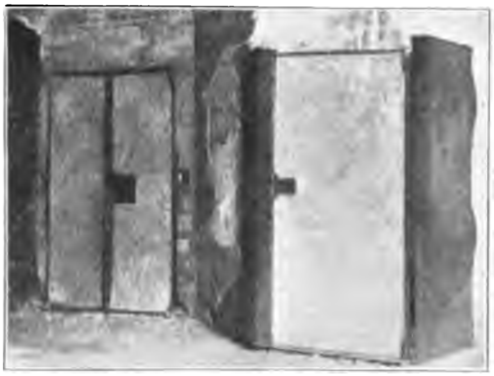
The thought is pleasing. Reason and precedent come to its support. My mind goes back at once to mosques and tile-faced walls of temples of the Orient—to the Alhambra, which the Arab left to Spain, and where he built a palace within frowning fortress walls; nothing but ragged rocks without, but within all the beauty of rich coloring and contour; domes studded with tile and stucco work in kaleidoscopic hue; corridors with mosaic floors and walls and facades embellished with sacred sentences worked out in multi-colored tile. Such a wealth of color as that left to us in the glazed tile of the Saracenic school can well encompass all our future needs. They robbed the rainbow and then added to it the sheen of fire and gilt.

It is said that the desire for color was born in desert tribes from somber seas of sand and changeless skies. It manifested itself in many colored robes and rugs and cashmere shawls. When conquest carried them to other lands and they built and learned to live indoors they took the brilliant colors of their cloths and put them in their walls and domes.

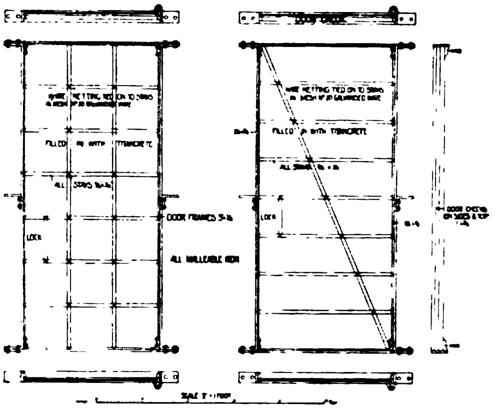
And if these walls were sometimes weak and stand to-day protected by the shell-like covering of fired clay, what might we do on walls we build like ours? May not our starved desire for beauty find relief in a combination of these two—the strength and permanence of our steel and tile and the beauty of adornment of the mosque? On these two may we build and at its proper time will come an added beauty of design which we may call our own, and thus create a city beautiful.

PRACTICAL TEST OF A FIRE-PROOF DOOR

The *Builders' Journal* (London), describing the effects of a severe fire in the premises of R. Wylie Hill & Co., at Glasgow, describes and illustrates some fire doors that resisted a very severe test on that occasion. They are composed of a skeleton of iron bars with a covering of wire of 1½-inch mesh filled in with a plastic composition called titancrete. No mention of the nature of this composition is given, but working plans of the doors and an illustration showing their condition after the fire are printed, copies of which we reproduce above.



THE COMPOSITE DOORS AFTER THE FIRE



TITANCRETE DOORS.

THE CLEVELAND BUILDING CODE ON "SLOW-BURNING" AND MILL CONSTRUCTION

THE subjects under this title relate principally to the interior construction of all buildings of the IV., V. and VI. classes—i. e., all "semi-fireproof," "mill" and "ordinary" constructed buildings as defined under title II.

SEC. I.—SEMI-FIREPROOF OR IV. CLASS BUILDINGS.

The term "semi-fireproof building" shall apply exclusively to all buildings in which the "mill" constructed floors or columns or the structural members which carry the loads and strains which come upon the floor and roof thereof, are entirely enveloped in incombustible material.

SEC. 2.—FIRE PROTECTION.

All iron and steel structural members in IV. class buildings shall be protected against fire as specified under the head of "Fireproof Construction," but a single thickness of any standard plaster as prescribed in Sec. 2, Title XIV., applied on metallic or wire lath shall be considered sufficient protection for all wooden posts, girders, beams, joists and the under side of the heavy doors and roof forming the ceilings. This coating of metallic lath and plaster shall, in all cases, follow the contour of the girders, beams and joists, and shall be applied directly to the ceiling without furring, so that there shall be no air spaces between any woodwork and the plastering. False beams may be inserted where required to form panels for ornamental purposes, provided that the plastering is continuous and the false work is properly fire stopped.

SEC. 3.—IV. CLASS PARTITIONS AND ELEVATOR ENCLOSURES.

All hall partitions and all elevator enclosures in buildings of the IV. class shall be made entirely of incombustible material. The use of wood furring or of stud partitions shall not be allowed in buildings of this class. Subdividing partitions may be the same as prescribed in Sec. 8.

SEC. 4.—FLAT CEILINGS.

In buildings of the IV. class if the wooden joists are not less than three (3) inches thick, containing not less than thirty (30) square inches of sectional area, and spaced not over sixteen (16) inches on centers, in a panel of the floor system, and are hung between the wooden girders with iron straps flat with the top of girders or supported on the flanges of iron girders with upper flange not more than one-half (½) an inch below the top of same, and the first thickness of one and five-eighths (1⅝) inches surfaced and matched flooring, provided under Section 7 is laid diagonally over the top and all intermediate spaces fire stopped and the furring and filling between the topmost and lower thickness of floors and roof is made deep enough to take all conduits and pipes, then the ceiling may be finished flat if made of terra cotta or of metal lath and incombustible plaster attached directly to the bottom of the joists.

SEC. 5—"MILL CONSTRUCTED" OR BUILDINGS OF THE V. CLASS.

The term "Mill Construction" shall apply to all buildings in which all the wooden posts, caps, girders, beams, or joists carrying a floor or roof shall be of solid pieces.

SEC. 6—DIMENSIONS OF TIMBERS.

The following are the minimum permissible sectional areas of posts and girders: Posts in the top most story, sixty-four (64) square inches, and one hundred (100) square inches in the next story below; for floor joists or beams, forty-eight (48) square inches, and sixty (60) square inches if the flooring is carried directly by girders or beams between columns and supports. The dimensions herein given are commercial sizes, and if surfaced, such surfacing shall not exceed one-eighth (⅛) of an inch in depth on each surface, provided all conditions of stability prescribed in Title V. are complied with.

All girders and beams containing less than one hundred and sixty (160) square inches shall be in solid pieces, and when two (2) or more beams are coupled they shall be framed solidly with bolts spaced not exceeding four (4) times the depth of beams on centers.

SEC. 7—FLOORS.

The floors in buildings of the IV. and V. classes shall be of either of the following thicknesses:

If of solid timber, not less than three and three-quarters (3¾) inches, or two and three-quarters (2¾) inches when covered with seven-eighths (⅞) inch flooring, or two and three-eighths (2⅝) splined and covered with two (2) thicknesses of felt, both of asbestos, or one of asbestos and one of waterproof felt covered with seven-eighths (⅞) inch flooring, or one and five-eighths (1⅝) inch surfaced, matched or splined with two (2) thicknesses of felt, as previously provided, furred up with strips not less than one and three-quarters (1¾) inches in width and not less than one and three-quarters (1¾) inches thick and the spaces between strips filled in with mineral wool or mortar, concrete, or other incombustible filling to the underside of the seven-eighths (⅞) inch flooring.

When buildings of this class have but one (1) thickness of one and five-eighths (1⅝) inch dressed plank flooring or wooden cap or bolster girder supports in every story, such building shall not exceed the area, height and number of stories of a VI. class building as prescribed in this code.

SEC. 8—V. CLASS PARTITIONS AND ELEVATOR ENCLOSURES.

Elevator enclosures in buildings of the V. class shall be made entirely of incombustible material. If iron or steel columns, girders or beams are used in buildings of this class, they shall be protected as provided for fireproof buildings or buildings of the IV. class. A covering of terra cotta one (1) inch thick, or a single thickness of incombustible plaster on metal or wire lath, will be permissible as a fireproofing in buildings of this class. Wooden posts, girders and floor beams need not be protected by fireproof covering. Three (3) inch splined wood partitions or incombustible stud partitions may be used in buildings of this class, but the use of wood furring and wooden lath is prohibited.

SEC. 9—CAST IRON OR STEEL COLUMNS IN "MILL" CONSTRUCTION.

At each line of floor or roof beams where cast iron columns are used in "Mill" construction, lateral connections between the ends of the beams and girders shall be made by passing wrought iron or steel straps across or through the cast-iron columns in such a manner as to rigidly connect the beams and girders with each other in the direction of their length. These straps shall be bolted through the wooden beams or girders. Steel or wrought iron columns shall be similarly secured.

SEC. 10—IRON CAPS.

If wooden posts are used in "Mill" construction, they shall have cast or wrought iron or steel caps so constructed as to form a base for the next post above, except as modified in Sec. 8, Title XIII. The girders must be properly bolted to cap, and if there is no provision for such bolting within the cap, additional wrought iron straps shall be used, extending from one girder to another, and bolted through each girder.

SEC. 11—"ORDINARY" OR VI. CLASS BUILDINGS.

All buildings of the VI. class or of "ordinary" construction shall have all wooden columns and caps framed solid, but no girder shall be built up of less than one and three-quarters (1¾) inch stock, when surfaced, and no such built up girder shall have joints between two (2) supports.

SEC. 12—SUBDIVISIONS OF FLOORS.

The interior of buildings of the VI. class may be subdivided and constructed of wood, as provided in title XIII., except the elevator enclosures, which shall be the same as prescribed in Section 8 of this title for "mill" constructed buildings. All party and division walls shall be of brick, as prescribed under their respective titles.

SEC. 13—MODIFICATIONS OF VI. CLASS BUILDINGS.

(a)—Buildings of the VI. class, which do not exceed three (3) stories of forty (40) feet in height, having a flat or gable roof, may have their gables and two (2) stories of their inner and outer court enclosing walls made of sheathed framework covered with sheet metal, slate or other incombustible covering, provided, that the total of such gable and court enclosures does not exceed twenty-five (25) per cent of the total length or total area of the exterior enclosing walls, and provided, further, that no interior or line court shall be so enclosed unless separated from the adjoining lot by a "dead" brick wall.

(b)—Buildings of this class which have but one (1) thickness of seven-eighths (⅞) or one and one-eighth (1⅛) inch flooring, or have their ceilings unplastered, shall not exceed the height and number of stories of a VII. class building.

(c)—No wooden girder or lintel of over four (4) foot span shall be used to support any brick wall or apron in buildings of this class, except that when a one (1) story VI. class addition to the front of a VII. class building is made as prescribed in title XXXII., wooden girders, with wooden posts spaced not exceeding ten (10) feet on centers, may be used, provided the pediment above the girder is not over five (5) feet high and not over one and one-half (1½) brick thick.

(d)—Buildings of this class with properly fire stopped double floors, as prescribed in Section 6, Title XXXIV., having all ironwork protected and all ceilings, partitions, and furring plastered with one (1) thickness of seven-eighths (⅞) inch metal or wire lath, as prescribed in Section 12, Title XV., may be carried up to the height of five (5) stories and a basement, but not over seventy (70) feet.

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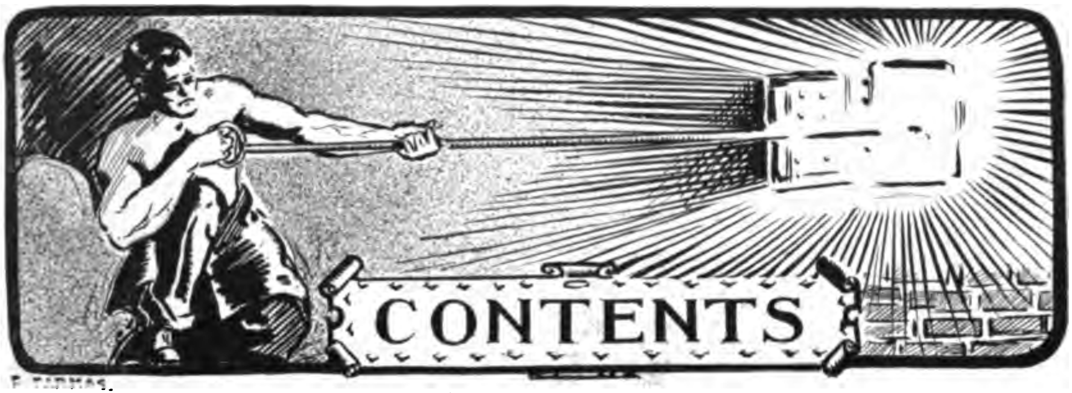

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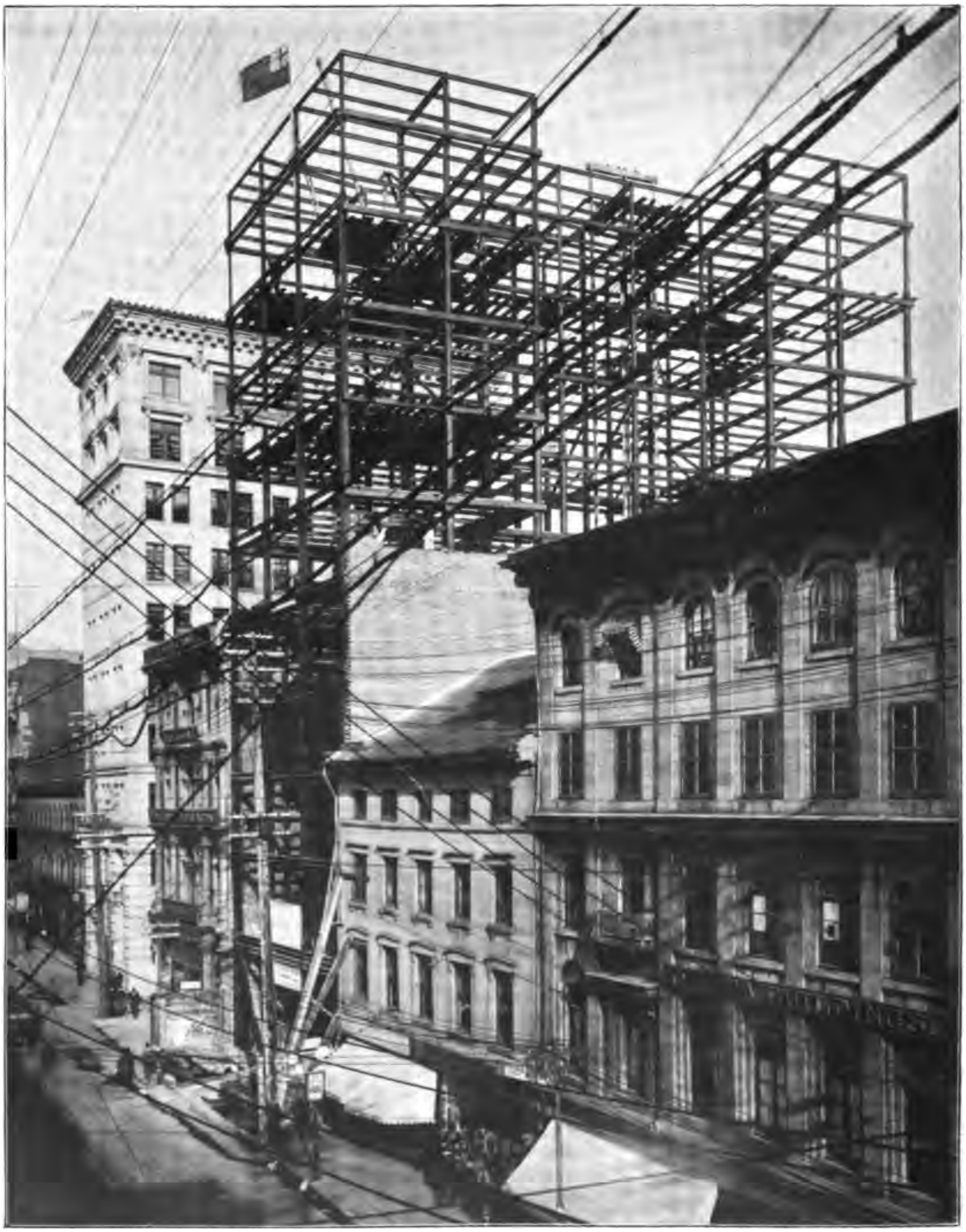

STEEL SKELETON OF THE HEAD OFFICE OF THE SOVEREIGN BANK OF CANADA AT MONTREAL, SHOWING ALSO THE BANK OF OTTAWA IN THE DISTANCE.

Both Fireproofed with Porous Terra Cotta Supplied by the Montreal Terra Cotta Lumber Company. H. C. Stone, Architect of both buildings; Charles Thackray, Contractor.

FIREPROOF MAGAZINE

Vol. 6. March, 1905 No. 3

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THE NEW PITTSBURG TERMINAL WAREHOUSES

Builders, architects, engineers and insurance people are greatly interested in a test of a new floor construction, which was made by the National Fireproofing Company at it Bedford avenue plant, Pittsburg, Pa.

The construction is to be employed throughout the floors of the big system of forty warehouses now under course of erection in Pittsburg for the Pittsburg Terminal Warehouse & Transfer Company.

These warehouses are located along the Monongahela river, will have first-class wharf and switching facilities for the transfer of all kinds of merchandise both by rail and water, and will cost about $2,000,000 when completed.

They will represent the highest type of fireproof construction, nothing but the latest and most improved materials being used, and the insurance rates will be the lowest ever given on any building of this class in the country. Chairman C. G. Smith of the National Board of Fire Underwriters has declared that their warehouses will be models of fireproof construction.

Mr. Charles Bickel of Pittsburg is the architect, and Messrs. Kindel & Glaffey are the engineers.

These buildings cover an area of 370 feet by 390 feet, with basement below first floor level, and six stories above. The four upper stories are divided longitudinally by a roadway 45 feet wide leading from Carson street, and extending from front to rear of building. Exterior walls are to be of brick, 13 inches between pilasters. No stone will be used in the construction of exterior walls, and all sills will be of terra cotta. The total height of buildings from railroad track to top of parapet wall is 90 feet.

The first floor is arranged for a terminal station with six tracks entering building; wide platforms are provided on each side of tracks for receiving and distributing of freight consigned to the different warehouses.

Elevators are provided for each warehouse, enabling tenants to receive goods directly in their respective warerooms, with equal facilities provided for shipping goods to outside points.

In designing the building skeleton construction has been employed, and consists of use of "Z" steel built-up columns beginning at the base and to continue to top of roof and connected horizontally at the floor levels with steel beams and girders, each floor being of sufficient strength to bear safely upon every superficial foot of its surface 350 pounds with a factor of safety of 4.

The soil is of such nature that it was deemed advisable to use concrete piles, and upon this foundation concrete piers were erected, supporting the base of the steel columns.

We print in this issue the full report of Prof. Ira H. Woolson of Columbia University, New York, on the tests made on the system of construction employed in the warehouses above referred to. In these he was assisted by Mr. W. L. Lemmon, consulting engineer for the National Board of Underwriters of New York City, and Mr. W. D. McGill, chairman of the local Underwriters' Board and fire marshal of Pittsburg. While the report states that the average temperature attained was 1,725 degrees F., at 2:39 p. m. it was 2,118 degrees. This was very nearly maintained from 2 to 3 p. m. Yet the report states that "the tile appeared to be in perfect condition, *with no cracks or broken parts.*"

The attention of our readers is also called to the article contributed by Mr. W. I. Parry of Pittsburg, which was suggested by witnessing the above described test of the National Fireproofing Company of floor construction for the terminal warehouses.

LABORATORY TESTS OF FIREPROOF MATERIALS

In the present issue of FIREPROOF MAGAZINE we print the results of two tests of the strength of fireproof partitions and one test of expansion and protection of a steel tie rod, and the results of two tests on columns, one of tile and one of concrete.

These results of tests have been received in the form given herein, without explanation or comment, from the National Fireproofing Company. We are only informed that they have been made in the testing station of that company at Chicago and that many other tests will be made and published from time to time. We will print them as fast as received for the information of the public. They appear to be so carefully and concisely tabulated as to require no further description. All the conditions and results essential to a test are clearly set forth in the diagrams. The rod test will evidently have a bearing upon future tests to be hereafter made, for the expansion of a tie rod, when protected in various ways and under a severe heat, is a serious matter when its use in connection with arch or lintel construction is to be considered—whether buried in the material or standing free with a covering of non-conducting material. The solid porous terra cotta four-inch partition has not heretofore been used in constructions, but its resistance to compression of 477 pounds per square inch before crushing in an independent section only 3 feet long, though 12 feet high, seems to be conclusive as to its practicability.

The tests of the strength of two columns of different manufacture, and of almost exactly the same dimensions, are especially interesting. By this it may be possible to ascertain the relative strength of reinforced tile columns and reinforced concrete columns. The difference in strength developed by these tests seems to be remarkable. Tile columns of this make have not heretofore been used in building construction. If they can be made at a reasonable cost 'it looks as if they might ultimately supplant both reinforced concrete and rolled steel. For cotton mills or other manufacturing buildings they seem to be particularly appropriate.

Competitive tests for strength and fireproof qualities between tile columns made by tile manufacturers and concrete columns made by concrete fireproofers are something that we will anticipate in the near future as a result of the National Company making its tests public.

(See pages 142-3-4-5.)

A FIRE TEST EXTRAORDINARY

Insurance Engineering for January publishes a very detailed description by Harry D. Gue of the new docks and sheds that have been erected at Hoboken for the North German Lloyd Company to replace those destroyed by the fire of June 30, 1900. The buildings, which are admirably planned for convenience and business purposes, are described as being constructed of steel, brick and concrete. The uprights and steel girders are covered with sheet steel cases filled with concrete for the protection of the constructive steel. The floors are described as being built with steel I-beams carrying segmental brick arches, and leveled up on the top with concrete. With regard to whether or not the lower flanges of these beams should be protected from fire, the engineer, Capt. Walter F. Whittemore, seems to have been in doubt, and how he satisfied himself on that subject was as follows: It is stated that he conducted a heat test on several spans of construction similar to that to be used. "An intense fire of wood was continued under the arches and beams for several hours, during which they were fully loaded. A total deflection *of four inches* through sagging of the beams was observed, which, however, was *entirely recovered upon cooling.*" This seems to have satisfied him that exposed steel under such circumstances is so thoroughly fireproof that he has caused the erection of floors which, according to generally accepted opinion of all architects, and of some engineers also, we hope, are anything but fireproof, as has been demonstrated in every actual fire that has been noted in buildings thus built for the last thirty years.

The published account also says: "In this connection, however, it may be said that the general steel construction is so heavy that only an extraordinary amount of heat would seriously affect the beam flanges; the upper floor of both the bulkhead building and pier sheds are used for passenger, baggage and office purposes only, hence the maximum amount of combustible material in these floors would always be very small."

We are surprised that *Insurance Engineering* should allow such statements, evidently supporting the conclusions arrived at by the engineer, to appear in its pages without comment. But the most astounding thing is that the great company which owns these buildings should erect them, with such total indifference to fire protection of constructive steel, after its experience in such a severe and destructive fire as that of June 30, 1900.

The utter inconsistency of *Insurance En-*

gineering in giving such statements prominence is shown in the article immediately following it on "'Fireproof' Construction," from which we quote as follows: "In the earlier examples of so-called fireproof buildings one of the commonest mistakes was to suppose that it was unnecessary to protect iron work from the effect of intense heat," and it quotes illustrations of the failures of unprotected iron and steel in actual fires, which it is quite unnecessary also for us to repeat. This is such a commonly accepted fact that there is no need to enlarge upon it. But if the engineer of the North German Lloyd Company has so much confidence in "heavy" steel to resist fire, he may be convinced to the contrary if he wakes up some morning and hears that his construction has fallen down from the effects of an "extraordinary amount of heat" generated from the combustion of baggage, goods and office furniture.

In this connection, we refer our readers to another part of this journal for an account, with illustrations, of a fire which occurred recently in a building in which there was absolutely no combustible construction whatever, used as a machine shop by the Western Electric Company at Hawthorne. While in this building combustible materials were entirely excluded, there was no fire protection to the constructive steel.

MR. ATKINSON'S LAST WORDS ON SLOW BURNING CONSTRUCTION

The article by Edward Atkinson in this issue sets forth clearly once more what he meant when in 1899 he commenced publishing articles about the improvements that had been instituted to restrict fires in the great New England cotton mills, which had previously been fire risks of the most dangerous kind. He then unfortunately used the words "slow burning" in describing the new mills, but was careful to say why they would burn slowly if all the conditions imposed by the Boston Manufacturers' Mutual Fire Insurance Company were complied with. Not only was that article incorrectly interpreted by a great number of the architects of this country, but they failed to read the pamphlet which he later circulated to correct these wrong impressions, entitled "Slow Burning Construction—What It Is and What It Is Not," and continued to erect *quick burning* stores and warehouses, using only the floor construction that he recommended, and thus practiced impositions upon their clients, who supposed they were getting improved conditions for the prevention of fire. The result has been disastrous, as Mr. Atkinson recognizes. These buildings (not the New England cotton mills) have been criticised severely by FIREPROOF MAGAZINE, and mention has also been made of the burning of some cotton mills in which the fire (as sometimes will happen) got the upper hand on the fire preventive equipment with which they were installed. "Slow burning," we hope, will now be considered as an obsolete expression. There is no such thing. A building is either fireproof or it is not. Some buildings may burn slower than others, but all such are combustible, and so-called "fireproof" buildings are only damaged more or less according to the nature of their inside finish and contents.

SLOW BURNING CONSTRUCTION

BY EDWARD ATKINSON.

This term has been applied to the system of mill construction which has been adopted in New England in building textile factories, paper mills, machine shops and other classes of works that are insured by the factory mutual fire insurance companies.

It consists of brick or stone walls, heavy timbers placed at 8 feet to 11 feet on centers, seldom over 22 feet spans (never without braces or knees) resting directly on square wooden posts—floors and roof of 3-inch or 4-inch plank groved and spliced—top floor of 1-foot boards, of late sometimes double, laid over courses of tarred paper swabbed with tar in the process of laying.

Minor details need not be given. No claim has ever been made that such buildings may not be destroyed by fire, the only merit consisting in the fact that when fires occur they can be more quickly brought under control than in a building of joisted construction of the common type.

One of the main principles of slow burning or mill construction is that stairways, elevator shafts and belt or rope transmission of power shall be in separate towers or cut off by fire resistant walls and doors from all floors, and that there shall be the least possible number, often no opening or belt holes in any floor.

Losses by fire in buildings of this class having been reduced to a very low term for a long period, the writer prepared an article for the Century Magazine in February, 1889, describing and illustrating this method of mill construction, hoping that it might lead to an improvement in the industrial architecture of the country. He has since had reason to regret this publication, as he had then no conception of the capacity of the masters of the art of combustible architecture to convert the slow burning method of using timber and plank into the most quick burning and destructive mode of building.

It had not occurred to him that anyone assuming to be an architect or builder would reason that if timber were not sawed into plank or plank sawed into boards it would not burn! Nor did it enter into his mind that so-called architects would assume that if the main elements of the structure were of solid timber and plank, all the stairways and shafts might be open and that varnished wood partitions, closets and cupboards might be put up anywhere all over the building. He did great injustice to the masters of combustible architecture and to their ability to apply their common rule even to mill construction; that rule being so to plan as to give a fire the freest and quickest course from cellar to attic in such a way as to be most fully protected from water.

Not anticipating the perversion of the method the writer was pleased to hear that his article had attracted wide attention and that many slow burning buildings of mill construction were being erected in many cities.

But, alas! within a short term came ominous words—accounts of the quickest possible destruction by fire of "slow burning buildings"—an outburst of protest from editors, firemen and others against any further practice on these lines.

Yet more: intimations soon came that

the writer was neither architect, engineer nor builder, and had misled the public by specious theories unsustained by any persons of authority anywhere.

This was a stern lesson. It taught the writer that in dealing with the fire hazard it must be assumed that the average architect, builder, owner and occupant had no comprehension of the alphabet or primer of fire prevention, and that in practice and occupancy each would go out of his way to make a building as unsafe as the use even of incombustible materials would permit.

Since that date there has been some progress in safety in a few lines, but even since the construction of buildings wholly of incombustible materials, many plans have been so skilfully devised as to assure the complete destruction of the contents without any salvage, thus making the settlement of losses with the underwriters very simple and speedy.

The writer has therefore been obliged to print and to reprint many times a supplementary article entitled "Slow Burning Construction—What It Is and What It Is Not," and by the use of this article he has been able to overcome some of the evil effects of his first essay.

In his own practice and that of his associates in the factory mutual system, there has been no reason to be discouraged nor do our clients complain.

We are now doing a considerable missionary business, sending various documents to applicants, architects or others, who can prove that they have passed a primary stage and are in a grammar school course in the principles of construction.

We have also made great progress in our Insurance Engineering Experiment Station, in many subjects of which the following is a list:

No. I Fireproof Wood—so-called.
No. II Soundproof Partitions.
No. III Wired Glass — Diffusion of Light.
No. IV Corrosion of Steel.
No. V Slow Burning or Mill Construction.
No. VI Mud Fuel, Coke, Gas.
No. VII Fire-resistant Roofs for Foundries and Machine Shops.
No. VIII Diffusion of Light.
No. IX Second Laboratory Report on Corrosion of Steel.
No. X Test of Columbian Fireproof Construction.
No. XI Fire and Heat Resistance of Luxfer Prism Glass Electroglazed.
No. XII Bog Fuel, Coke, Gas and Secondary Products of Gas.
No. XIII The Conflagration in Baltimore.
No. XIV The Protection of Theaters.
No. XV Bog Fuel, Briquettes, Coke and Gas.
No. XVI Composition Roofs (in press).

We shall soon be prepared to establish the relative cost of slow burning or mill construction as compared to steel, concrete and terra cotta, and to lay down the rules for protecting each type from injury or loss by fire or from long continued heat.

We are about prepared to lay out a suitable course in insurance engineering, which may become a part of the prescribed course in architecture and constructive engineering in our technical schools and universities.

AMERICA IN MINIATURE

BY

CHARLES EUGENE BANKS

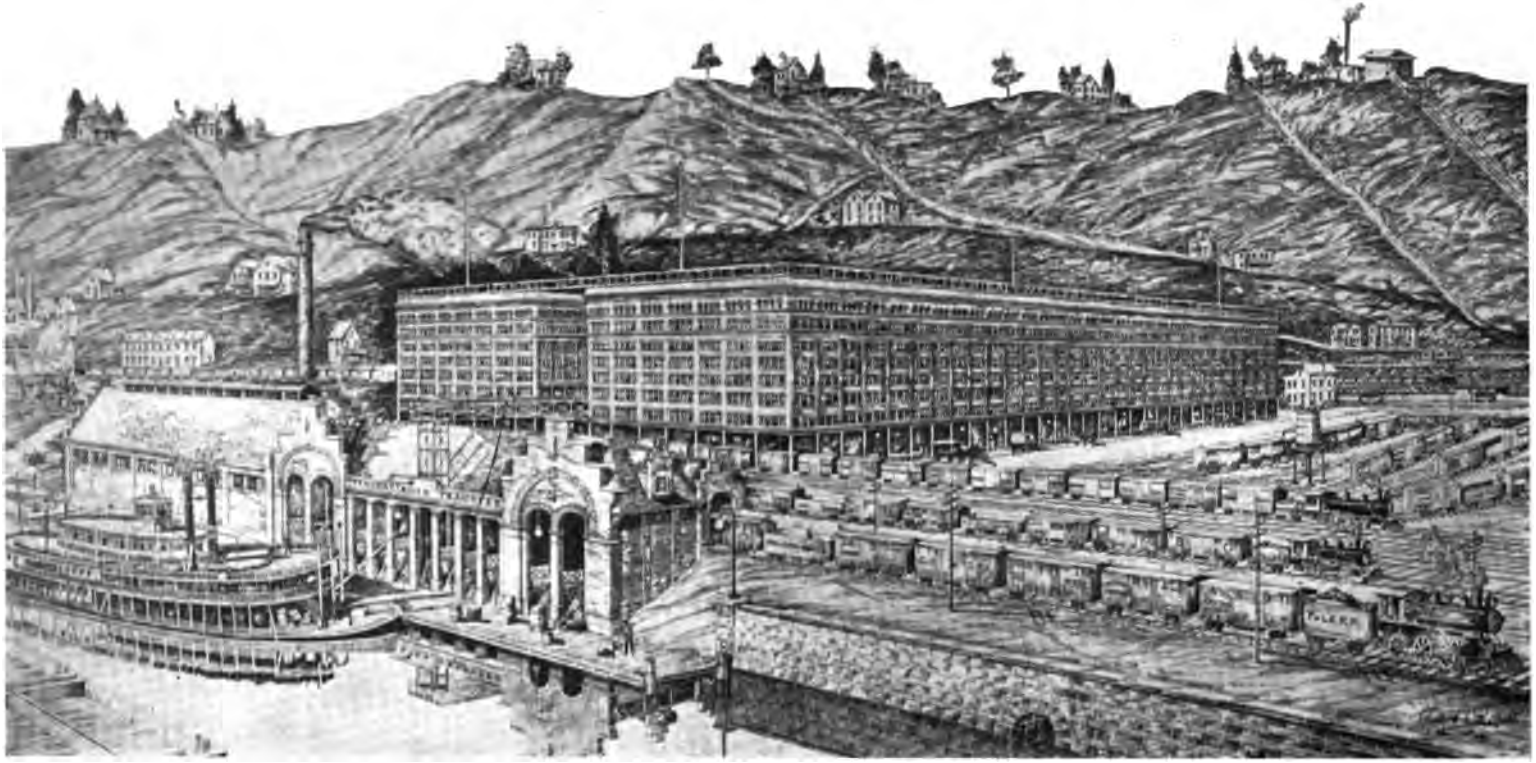
I stood before the portals of a pile,
Square-walled, thick-windowed, plain and unadorned,
But lifted high above the smoke and roar
(Marks of the city's life that gave it birth),
A pile man's art had made impervious
To all attacks of his fierce foeman—fire.

I entered. Lo, from curb to dizzy dome,
'Twas honeycombed with rooms where toilers plied
The pens and keys wherewith thoughts were transcribed,
That held the hopes of many millions more.
A world of work that touched the verge of life
With something of all people centered there.

"Behold America in miniature!" I cried.
"Those firm foundations are deep laid and strong,
Those giant beams, that late were shapeless ore,
Now like true brothers, tried by fiercest flame,
By wild, hot conflict, with strange forces bent
On their destruction, come to wondrous strength;
Knit, linked and bound into one giant whole,
That faces all ways, challenging all foes.

"The stern and steady pile of fireproof steel,
Housing its thousands, toiling on secure;
The unioned Nation, tried in fiercest fire
Of bloody conflict, housing peaceful hosts;
Both holding, shielding, safely guarding men
And women working toward their several goals,
Yet all close woven into one great plan,
Trusting their hopes, their fortunes and their lives
To one great cobwebbed structure reared to trade,
To commerce, science, art—and trusting well.

"Toil on, ye builders of the town and state,
Let roar the furnace, flow the blushing steel,
What though yourselves shall tread the furnace bed,
From out this toil and struggle, burning pain,
Shall come that dear perfection to our dreams,
And all men shall have freedom without fear."



GENERAL VIEW OF THE PITTSBURG TERMINAL WAREHOUSES, AS THEY WILL APPEAR AFTER COMPLETION.
From the Architect's Pen and Ink Drawing. Charles Bickel, Architect, Pittsburg, Pa.

PROFESSOR WOOLSON'S TEST ON A SAMPLE OF FLOOR CONSTRUCTION FOR THE PITTSBURG TERMINAL WAREHOUSES

COLUMBIA UNIVERSITY, DEPARTMENT OF MECHANICAL ENGINEERING TESTING LABORATORY

REPORT OF A FIRE, WATER AND LOAD TEST MADE UPON A HOLLOW TILE GROINED ARCH FLOOR CONSTRUCTED BY THE NATIONAL FIREPROOFING COMPANY AT THEIR PLANT IN PITTSBURG, PA. TESTED DECEMBER 7, 1904.

WEATHER OBSERVATIONS.

Day cloudy, with light snow in forenoon. Medium strong wind from northwest. Temperature, 36 deg. to 38 deg. F.

Test started, 11 a. m.
Water applied, 3:16 p. m.
Age of floor when tested, 24 days.

METHOD OF CONSTRUCTION.

The test building was of steel frame construction, 20 by 22 feet, with corner posts and I-beam girders between. The longer girders were 24 inches deep and the shorter ones 18 inches deep. This frame was encased by a 13-inch brick wall on two sides and by a 9-inch combination tile and cement wall on the other two sides, the object being to study the relative merits of the two types of walls as fire barriers.

The floor to be tested constituted the roof of the test building. It was constructed by forming a groined arch of 6-inch hollow tile between the girders, with a rise of 17 inches at the crown. Above the tile was concrete filling of about 4 inches over the crown and 18 inches at the haunches. The arches were sprung from the corners of the rectangular floor space instead of the sides, thus throwing the greatest thrust to the corners where the framework could best resist the load.

For purpose of reinforcement two 8-inch I-beams were put in between each pair of girders at the middle and meeting in the center of the floor span. These beams were cambered to the curvature of the arch and divided the test floor into four equal parts. They were encased by the floor tile.

The construction was practically a reproduction of one unit of the floor system to be used in the new Pittsburg Terminal Warehouse & Transfer Company, in which there are to be 800,000 square feet of floor space, all divided into spans 20 by 22 feet, the same as this.

In the warehouse building the thrust on one side of a girder would be resisted by the stiffness of the girder itself, supported by the thrust on the opposite side, due to the adjoining floor span. To approximate these conditions in the test building, large I-beams were placed vertically against the outside of the walls, two on each side, spaced to give reinforcement to the girders at points about one-third of the span from each corner post. These I-beams were securely anchored at the bottom and were fastened in pairs across the building just over the roof, by large tie-rods with turnbuckles to bring them snugly to place. Similar tie-rods were put in diagonally between the corner posts, the effect being to hold the main girders securely in place and prevent possible deformation. Full details of the construction are shown in the attached blue-prints and photographs.

The floor proper of the test building was formed of an open checkerwork of brick, the same as a kiln floor, and upon this the fire was built. The ceiling was 15 feet 4 inches above the floor. Suitable draft openings, smoke flues and firing door were provided.

The concrete fill was mixed in the proportion of 1 vulcanite Portland cement, 3 river sand and 6 gravel. The tile ceiling was given a protective coating of one inch of cement.

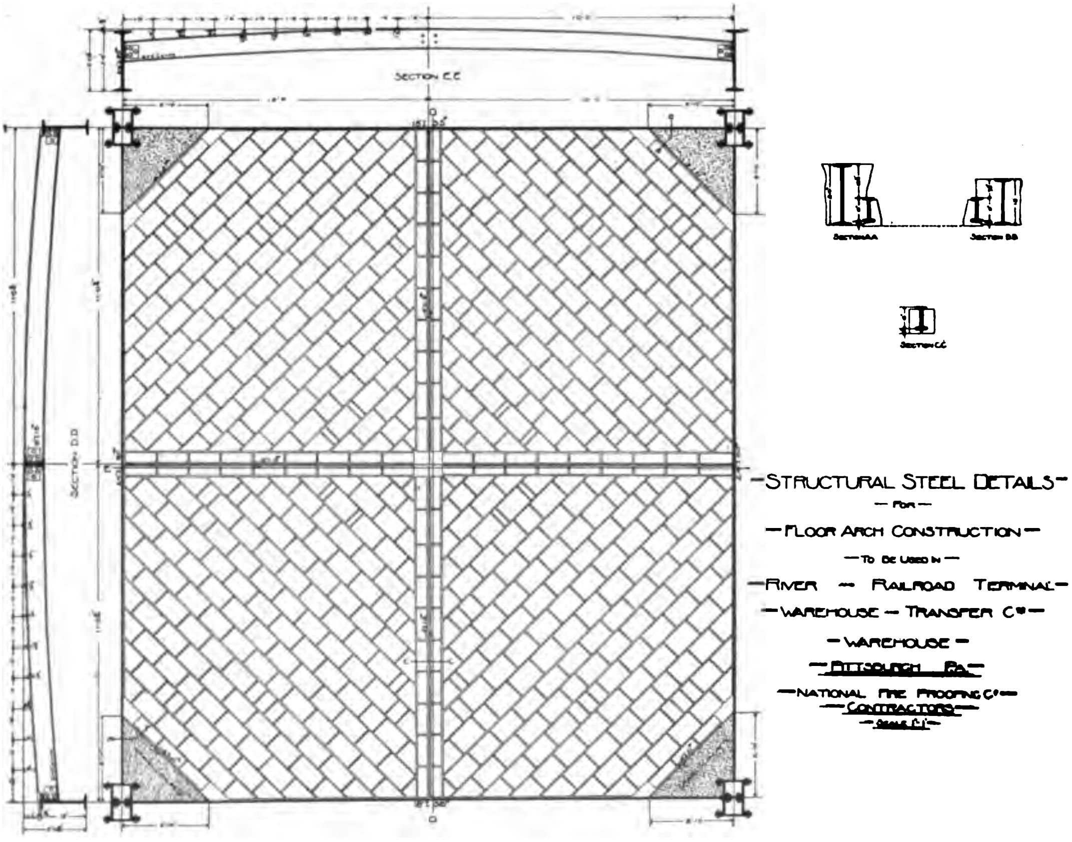
PURPOSE OF THE TEST.

The purpose of the test was to determine the effect of a continuous fire below the floor for four hours at an average temperature of 1,700 degrees F., the floor carrying at the same time a distributed load of 270 pounds per square foot, at the end of the four hours, the under side of the floor (or ceiling), while still red hot, to be subjected to a 1⅛-inch stream of cold water at short range under 60 pounds pressure for ten minutes. Deflection of floor to be measured continuously during the test.

TEMPERATURES.

The temperatures of the fire were obtained by two electric pyrometer couples suspended through the floor from above and hanging about 6 inches below the ceiling. One couple was near the crown of the arch, and the other in a corner, distant about 3 feet from each wall.

Readings were made upon each couple every 3 minutes. The fuel used was dry refuse wood, the frequency of firing being


Section C.C
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Section B.B
Section C.C
Section D.D
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D
—Structural Steel Details—
—For—
—Floor Arch Construction—
—To be Used in—
—River — Railroad Terminal—
—Warehouse — Transfer Co—
—Warehouse—
—Pittsburgh Pa—
—National Fire Proofing Co—
—Contractors—
—Scale

determined by the temperature of the test chamber. The "Log of Temperature Readings," together with plotted curve for one couple, is attached herewith.

DEFLECTIONS.

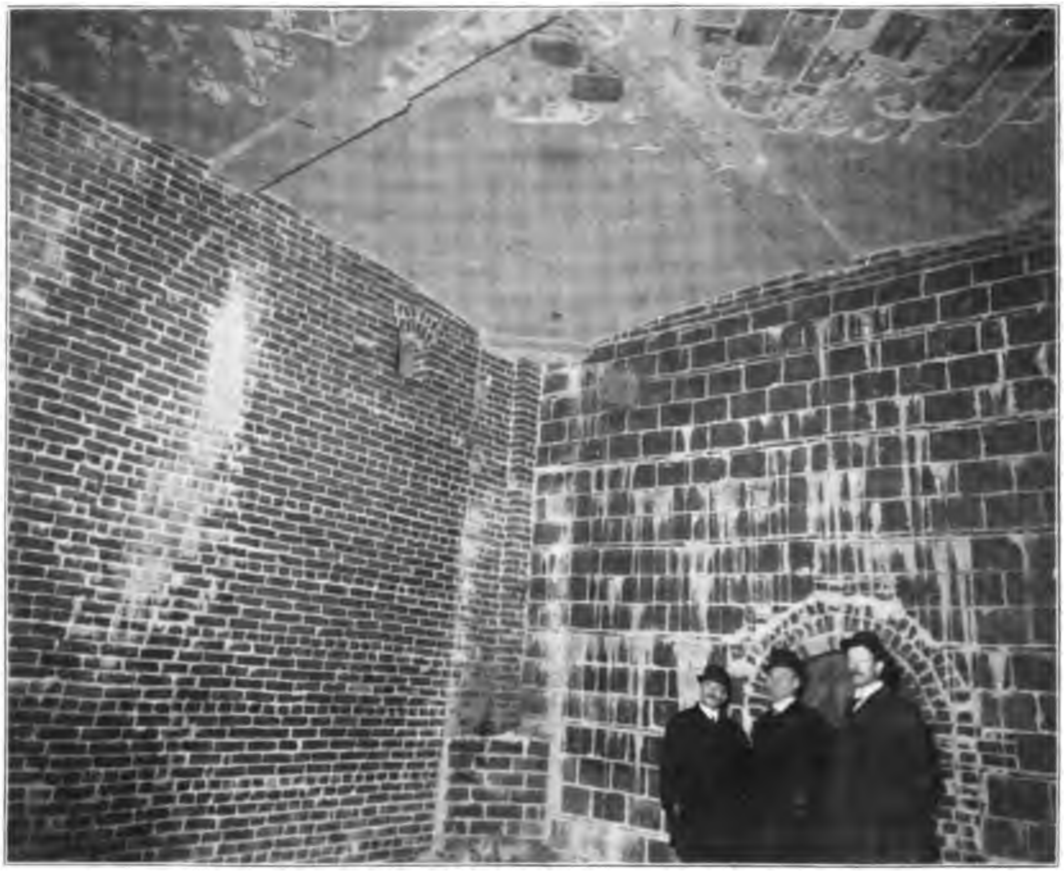
The deflections which occurred at various stages of the test were measured by a Y-level reading upon a rod located upon the middle of the floor slab. The deflections were read by Mr. Bailey, an engineer detailed from the Pittsburg Testing Laboratory.

The attached table gives full details of the variations in level throughout the test.

WATER.

The water was applied by city firemen

BUILDING BEFORE TEST, WITH LOAD OF 270 POUNDS PER SQUARE FOOT.



INTERIOR AFTER FIRE.

with a steamer detailed for the purpose from Engine Company No. 26. Captain Leonard Smith was in command. Owing to the location of the hydrant, it was necessary to use 500 feet of 3-inch hose, but the engineer reported that he maintained a pressure on his gauge varying from 100 to 120 pounds per square inch during application of the water, and this was augmented by a fall of 40 to 50 feet between the engine and the test house, so although a long line of hose was used it is safe to say that the nozzle pressure was well above 60 pounds. The firemen estimated it at 75 to 80 pounds.

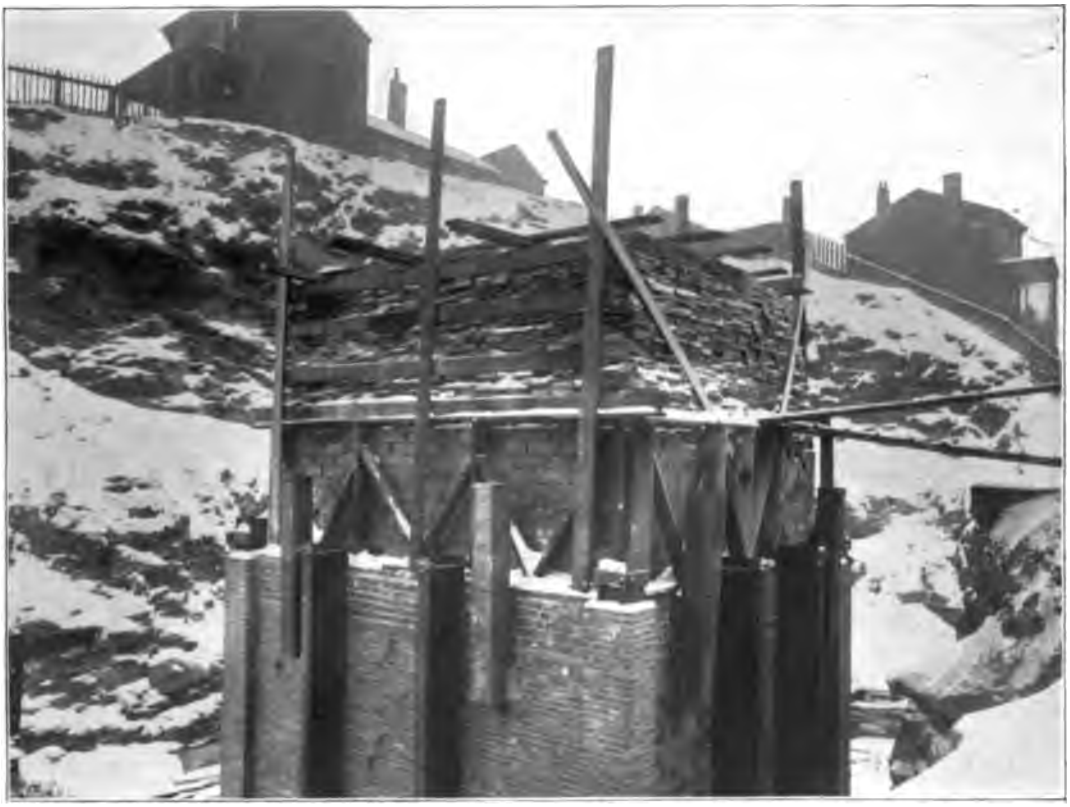
In applying the water the stream was thrown back and forth over the whole ceiling as much as possible and not allowed to strike continuously in one place. As it was not practicable to flood the roof, as is customary in tests of this character, the stream was played on the ceiling continuously for ten minutes at full pressure.

RESULTS OF THE TEST.

Owing to the very large size of the test chamber and an insufficient flue area for the volume of fire, together with the fact that the fuel supply in the early part of the test was not suitable to feed a fire of such magnitude, it was impossible to get high temperatures during the first half of the test.

The quality of the fuel was changed during the latter part of the test, and, the building having become thoroughly heated, it became easy to maintain high temperatures.

Because the temperatures in the early part of the test were low, which resulted in lowering the average, it was decided to



AFTER TEST LOAD OF 1,000 POUNDS PER SQUARE FOOT.

ignore the first fifteen minutes of the test and make it up by extending the time fifteen minutes over the four hours. The temperatures during the first fifteen minutes are given in the "Temperature Log," but they were not used in calculating the averages.

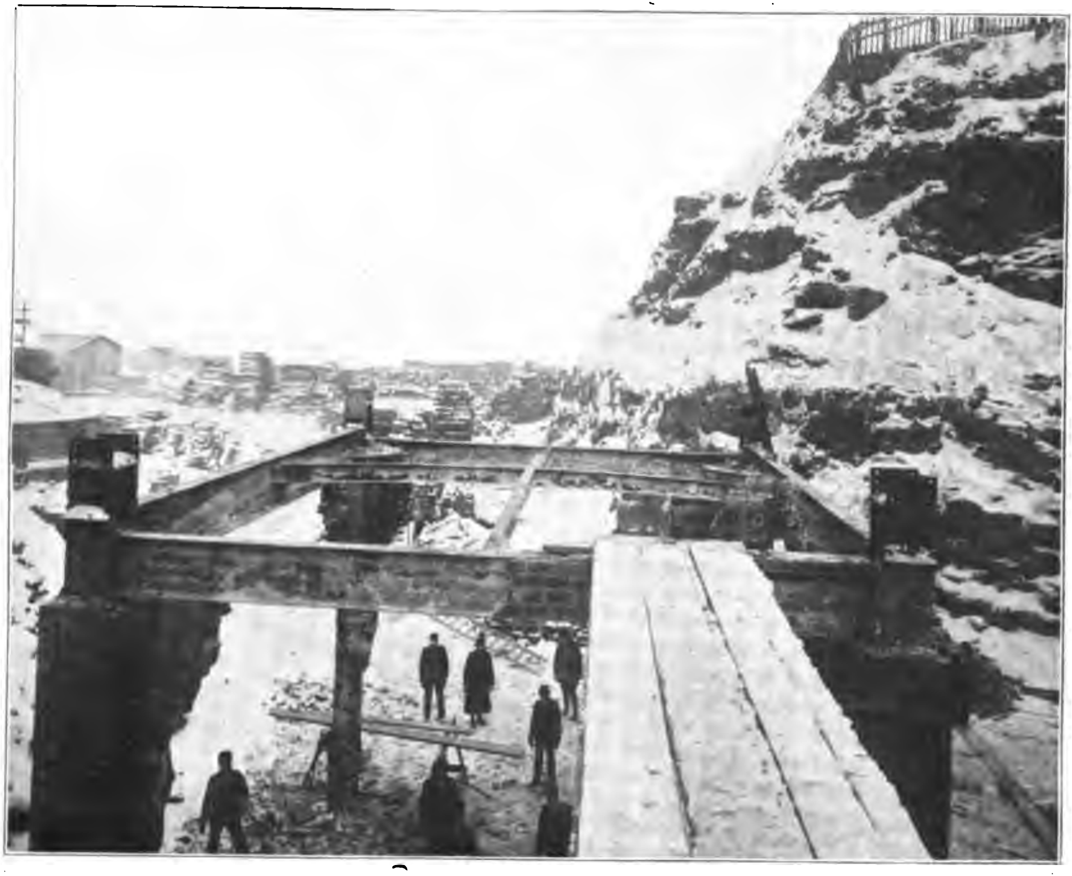
The cement coating on the ceiling began to blow off about ten minutes after the fire started, and a considerable portion of it fell before the expiration of the test. The roof was covered with a load of hollow tile several feet deep, making it impossible to ascertain whether any cracks developed there or not. As the roof was in compression in all parts, and the deflections recorded were very small, it is not likely that cracks did occur there.

After application of the water it was found that the cement coating was gone and the tile exposed where the water struck the ceiling, but the tile appeared to be in perfect condition, with no cracks or broken parts. At least, none were apparent under a hasty inspection by torch immediately after the test.

The maximum deflection recorded during the test was a trifle under one-half inch, and the average temperature at the middle of the ceiling was 1,725 degrees F.

The attached photographs show the building during all periods of the test and indicate the condition of the test floor and building after the test. A photograph is also shown of a duplicate test building in process of demolition. It gives a good idea of the arrangement of the 8-inch cambered beams, and the construction in general.

The company informed me that the floor was subsequently loaded up to 1,000 pounds per square foot, with a maximum deflection of 1½ inches. A photograph showing this load is included.



VIEW SHOWING METHOD OF CONSTRUCTION. TAKEN AFTER REMOVING TEST HOUSE AND HOLLOW TILE WORK.

The National Fireproofing Company was represented at the test by:

D. F. Henry, chairman board of directors.

W. D. Henry, president.

R. W. Allison, vice-president.

H. M. Keasbey, vice-president.

Adam Wilson, director.

Officials of the Pittsburg Terminal Warehouse & Transfer Company present were:

Charles Bickel, architect.

J. I. Buchanan, president.

J. A. Henderson, vice-president.

G. W. C. Johnston, secretary and treasurer.

R. J. Miller, superintendent.

The National Board of Fire Underwriters were represented by:

W. L. Lemmon of New York.

And the local board by:

W. D. McGill, secretary.

A number of other engineers, architects and builders were among the spectators.

Respectfully submitted,

IRA H. WOOLSON.

Log of Temperature Readings during Fire Test of a Hollow Tile Floor constructed by the National Fireproofing Company. Tested at Pittsburg, Pa., Dec. 7, 1904.

TEMPERATURES READ BY G. W. BULLEY.

Note:—In the following, where temperatures are bracketed, the actual readings for those times are assumed to be a fair average of the actual temperatures existing then and are obtained by taking an average of the temperatures before and just after the last readings.

Time.	Couple No. 1.	Couple No. 2.
11:03	104	90
11:06	901	736
11:09	1,188	963
11:12	1,504	1,143
11:15	1,445	1,038

(The above figures are omitted from the averages.)

Time.		Couple No. 1.		Couple No. 2.
11:18		1,462		1,041
11:21		1,448		1,025
11:24	**Couple broken and reading lost.**	1,460		1,070
11:27		1,460		1,221
11:30		1,460		1,236
11:33		1,460		1,291
11:36		1,460		1,321
11:39		1,460		1,291
11:42		1,501		1,382
11:45		1,546		1,546
11:48		1,503		1,548
11:51		1,368		1,399
11:54		1,519		1,474
11:57		1,399		1,399
12:00		1,453		1,413
12:03		1,357		1,432
12:06		1,396		1,416
12:09		1,402		1,357
12:12		1,357		1,371
12:15		1,357		1,326
12:18		1,341		1,326
12:21		1,326		1,357
12:24		1,371		1,387
12:27		1,402		1,416
12:30		1,492		1,582
12:33		1,387		1,402
12:36		1,402		1,432
12:39		1,463		1,485
12:42		1,357		1,402
12:45		1,387		1,416
12:48		1,441		1,432
12:51		1,449		1,449
12:54		1,477		1,551
12:57		1,499		1,506
1:00		1,492		1,463
1:03		1,477		1,463
1:06		1,537		1,492
1:09		1,544		1,499
1:12		1,559		1,530
1:15		1,636		1,612
1:18		1,629		1,596
1:21		1,665		1,629
1:24		1,701		1,650
1:27		1,733		1,650
1:30		1,755		1,657
1:33		1,807		1,737
1:36		1,866		1,762
1:39		1,913		1,770
1:42		1,890		1,762
1:45		1,866		1,785
1:48		1,935		1,815
1:51		1,964		1,845
1:54		1,980		1,874
1:57		1,890		1,793
2:00		1,928		1,822
2:03		1,963		1,851
2:06		2,062		1,963
2:09		2,098		2,003
2:12		2,120		1,978
2:15		2,136		1,986
2:18		2,077		1,942
2:21		2,032		1,942
2:24		2,063		1,957
2:27		2,070		1,979
2:30		2,114		2,004
2:33		2,137		2,011
2:36		2,151		2,032
2:39		2,182		2,047
2:42		2,167		2,063
2:45		2,151		2,063
2:48		2,131		2,014
2:51		2,102		1,989
2:54		2,116		2,005
2:57		2,109		1,967
3:00		2,116		1,952
3:03		2,121		1,943
3:06		2,114		1,950
3:09		2,107	**Couple broken and reading lost.**	1,940
3:12		2,107		1,940
3:15		2,092		1,940
Average from 11:15 to 3:15		1,725.4		1,642.2

REPORT PITTSBURG TESTING LABORATORY, LTD.

Pittsburg, Pa., Dec. 7, 1904.

Record of Arch Deflection Under Action of Fire and Water.

Test conducted December 7, 1904, at the National Fireproofing Company, Plant No. 1, Pittsburg, Pa.:

Time. a. m.	Deflection, feet.
11:03	0
11:18	0.01
11:33	0.02
11:48	0.03

Time, p. m.	Deflection, feet.
12:03	0.04
12:18	0.04
12:33	0.03
12:48	0.03
1:03	0.03
1:18	0.02
1:33	0.02
1:48	0.01
2:03	0.01
2:18	0.01
2:33	0.01
2:48	0.01
3:03	0.015
3:18	0.015 quenched
3:28	0.02
3:38	0.03
3:43	0.035
3:48	0.04

Maximum drop of arch, 0.04 feet.

HOW TO REDUCE THE ANNUAL ASH-HEAP

A saving for the people of many millions will be made when they have come to realize the advantages of fireproof construction. Not many people realize that the ash-heap of 1904 means an actual dead loss of $230,000,000, which is nearly $60,000,000 more than the highest previous record. Some may remark that insurance largely covers this terrific loss, but the insurance premiums also come from the people, and for every dollar paid out by the companies something like three dollars have been taken in. The tendency so far has been to improve fire-fighting methods and appliances, and to-day we have fire departments that are unequaled in efficiency and alacrity. In constructing large buildings, especially commercial ones, men have grown wise enough to use fireproofing methods in the structural parts, and as little combustible materials in others as is compatible with proper economy. Where they have not sense enough to do so voluntarily, building laws generally compel them. It is in the construction of houses, where people do more or less what they please, that wood is still used more than far-sighted judgment would justify. There was a time when such construction was made inevitable by economy, but in the last twenty years timber has gone up over one hundred per cent, while the prices of brick and tile and cement, by reason of improved methods of manufacture, have been cheapened so much that, all things considered—durability, repairs, warmth in winter and coolness in summer, insurance, freedom from vermin—a fireproof house means a better investment ultimately than a wooden one. There are cases where even the first cost of a fireproof house is less than it would have been had it been built of wood. As a general proposition, the country over, the additional cost of first-class brick and tile construction is anywhere from five to ten per cent more than for wood. In the ordinary dwelling there are floor joists, cross-bridging, a rough floor, paper or other deadening material, and a finished floor—all combustible, the whole costing something like twenty-five cents a square foot, including the plaster on the ceiling below. In fireproof construction, using hollow tile in monolithic wide spans, covered with an asbestolithic or other incombustible plastic flooring, and the under side plastered, there is an expenditure of from twenty-six to twenty-eight cents. Is not the use of wood in private dwellings a habit which ought rapidly to disappear?—From *Collier's Weekly*, January 28.

The *Western Underwriter* has this to say anent Mr. Richie's article on "Fireproofing vs. Fire Insurance" in FIREPROOF MAGAZINE for January:

If the property owner wants a lower rate, let him improve the physical condition of his risk. That his efforts to reduce the hazard may not be thwarted by his neighbor, who builds a firetrap beside him, or by the municipality, which lets its fire department or waterworks fall into decay or allows the streets to become full of electric wires, let him, as a citizen, unite with other citizens who also want reduced rates to get good municipal legislation and administration. Given in every city and town a stringent building ordinance and electrical ordinance, thoroughly enforced, an efficient fire department and ample water supply, and there would be much less complaint about rates, for they would be reduced. These things cost money, but not as much as high insurance premiums do, and they offer the great advantage that they reduce the hazard that every property owner himself carries of destruction of values above the amount insured and losses from interruption of business.

SOMETHING NEW IN FIREPROOFING

OBSERVATIONS ON A FIRE TEST OF A SECTION OF FLOOR FOR THE PITTSBURG TERMINAL WAREHOUSES

BY W. I. PARRY.

THE new River and Railroad Terminal Warehouse, which is being erected on the South Side of Pittsburg, with a frontage on the Monongahela River and track connections with the leading railroads, attracts attention on account of its unusual magnitude and additional interest is excited by its method of construction.

In the first place, it exhibits probably the most extensive use of long concrete piles for foundation purposes. The second point of especial interest is the system of fireproofing employed, which, although novel in its methods, suggests in a way old and almost ancient types of construction.

The building is composed of a series of rectangles, about 20 by 22 feet, with columns at the corners and beam girders forming the four sides. The longer girders are twenty-four inch and the shorter ones eighteen-inch beams. In each of these rectangles is built a groined arch of six-inch hollow tile, with a rise of about seventeen inches at the crown. Above the tile is a concrete filling of about four inches at the crown of the dome and about eighteen inches at the haunches. These arches are sprung from the corners of the rectangles, nine-inch beams being used as skewbacks, framed diagonally across the corners of the rectangles, throwing most of the thrust to the corners where the framework is carried by the columns. As a reinforcement and also acting in the same way as the ribs or skeleton in the old groined ceiling used in cathedral construction (which, by the way, was very well illustrated in the description of St. Paul's Church, Chicago, published in the December number of the FIREPROOF MAGAZINE), bent eight-inch beams are framed into each pair of girders at the middle of their span, framing into each other at the center of the floor space which is the crown of the dome. These beams are cambered to the curvature of the arch and divide the rectangular section of floor into four equal parts. They are encased by floor tiles as shown in accompanying drawings.

One of these rectangular sections withstood a fire, water and loading test with most gratifying results. The purpose of the test was to determine the effect of a continuous fire below the floor for four hours at an average temperature of 1,700 degrees Fahrenheit, the floor carrying at the same time a distributed load of 270 pounds per square foot. At the end of the four hours, the under side of the floor or ceiling, while still incandescent, was subjected to a stream of cold water at short range. The deflection of the floor was measured constantly during the test.

After the application of the water it was found that the tile was in perfect condition without breaks or cracks. The maximum deflection recorded during the test was slightly under one and one-half inches and the average temperature at the middle of the ceiling was 1,725 degrees Fahrenheit.

After the fire test the floor was loaded to 1,000 pounds per square foot which, with a factor of safety of four, is equivalent to 250 pounds safe live or superimposed load with a maximum deflection of one and one-half inches.

The test was decidedly severe and the construction proved itself equal to the demands, as the structure was designed to carry a live or superimposed load of 250 pounds per square foot.*

The accompanying drawing illustrates this construction, the plan showing the position of columns and beam girders framing into them, the nine-inch skewback beams at the four corners of the rectangle, the position of the cambered or bent beams across the middle of the floor sections and the arrangement of the six-inch tile arches.†

The particular thing that excites the writer's interest, independent of the novelty of this construction, is some of the characteristics which suggest older methods and also the coming together of types of construction which are often opposed in the controversies over rival fireproofing systems.

In the first place, does not this construction suggest in a way the Guastavino arch and dome construction which came into notice about twelve or fifteen years ago and of which the Boston Public Library is a prominent and very successful example? Of course the curved beam was not used nor the six-inch arch, but there was the dome principle and the union of terra cotta with concrete, making a composite construction of which both of these good agents form a part. But this work does not suggest the Guastavino type alone; it goes many, many years farther back. Notice the principle of the rib or skeleton on which the old cathedral ceilings were built; it is true their ribs were not steel but they performed the office of keys or the basis or skewback for the vaulted arches forming the dome, which is precisely what our bent eight-inch beam is doing, although it acts more fully as a tie and a frame to hold the arch in place, particularly during erection. While the diagonal nine-inch beams form similar ribs to receive and direct the thrust, they also form an eight instead of a four sided section, making the dome idea a possibility.

Going back still farther than the medieval construction, we come to the old Roman method, the union of burnt clay and concrete taking the place of the terra cotta of our new arch and forming, in combination with concrete, a roof or covering which suggests the lid of a pot and making a lasting construction that has so many still enduring examples. This union of the two elements, baked clay and concrete, seems to be a step toward ideal construction for fire resistance and durability.

It is apparent that by enclosing each one of these sections with brick walls a series of fire-resisting vaults can be secured, by which means any fire that might be started could be confined to the original unit in which it began.

The construction which has been illustrated in this article was developed by the architect, Charles Bickel, and the National Fireproofing Company of Pittsburg. The design was the result of their effort to produce the type of fireproofing best adapted to the particular conditions required in this warehouse, which will be used in the storage of goods and therefore be called upon to carry unusually heavy loads. Its first cost may not, perhaps, be as cheap as some of the ordinary types of fireproofing, but, taking into consideration its durability and fire-resisting qualities, it is not an extravagant construction and it is admirably adapted to the purpose for which it was designed.

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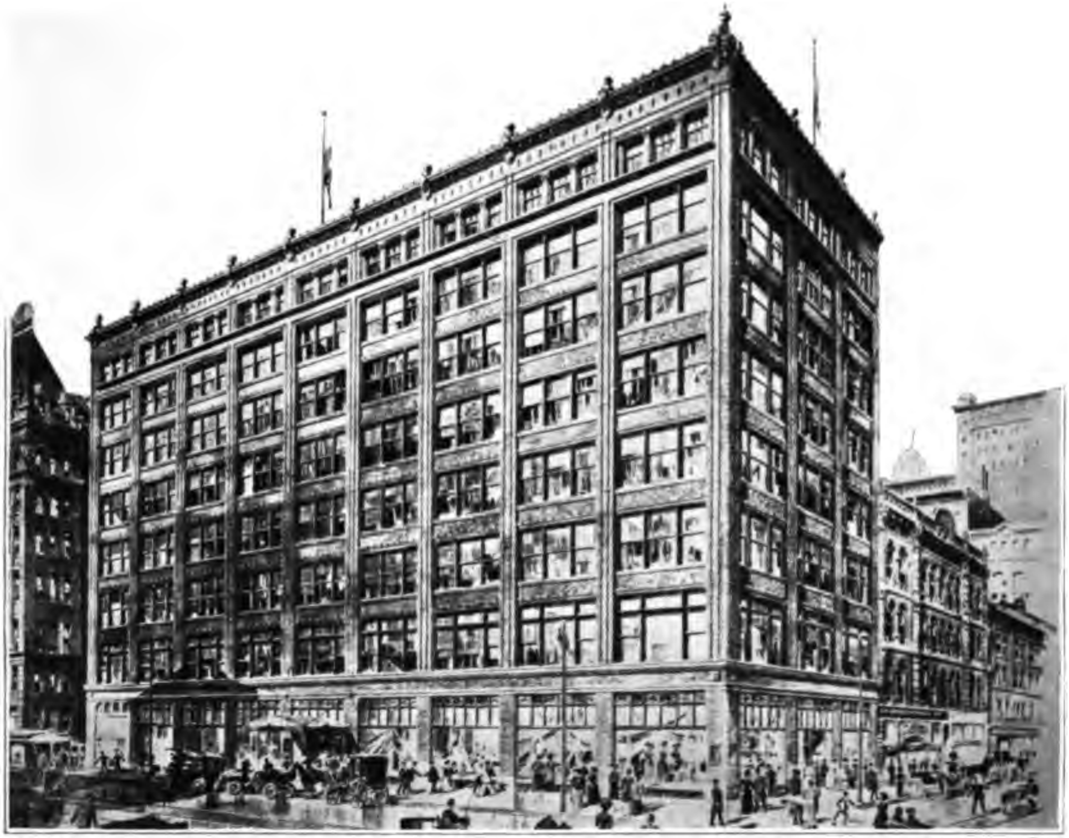
*See illustrations to previous article.

†Additional illustrations for Mr. Parry's article were unfortunately destroyed by fire at the engravers before the make-up of this number.



THE L. S. AYRES & COMPANY'S STORE BUILDING, INDIANAPOLIS, IND.

VONNEGUT & BOHN, ARCHITECTS, INDIANAPOLIS.

This building is sixty-seven feet front by one hundred and ninety-five feet deep, with a plain exterior, essentially a store, without any attempt at over-decoration. The exterior is a buff-gray brick, with terra cotta cornices and sills of the same color. The first story is virtually a continued showcase, with narrow structural piers of but very little reveal, and is an admirable arrangement for the display of goods. It is a steel skeleton frame, with fifteen-inch hollow tile arch flooring and hollow tile partitions. The stairways and elevators are enclosed in fireproof partitions, with automatic fireproof doors. The finished flooring will probably be of plastic cement, and everything is done that can be consistently, to provide an absolutely indestructible construction. Ample provision is made for sprinkler systems and it is doubtful if a fire could at any time or under any circumstances do over $20,000 worth of damage, and that to a very limited quantity of stock on one floor. The total cost of the building will be about $300,000, and it is under contract to be completed by September, 1905. Tile setters will have an opportunity of showing what they can do in this building, as they have done in so many big structures in the West, in the way of finishing off a floor every twenty-four hours. Work on the building is now in progress.

National Fire Proofing Company.
Testing Station, Chicago.

NUMBER OF ARTICLE	WHEN MADE	WHEN TESTED	FIRST SERIOUS CRACK	MAXIMUM PRESSURE	CUBIC INCHES IN PARTITION	STRENGTH PER SQ. INCH
1131	8/18-04	11/18-04	20 TONS	34 TONS	20,942.5	477.28*

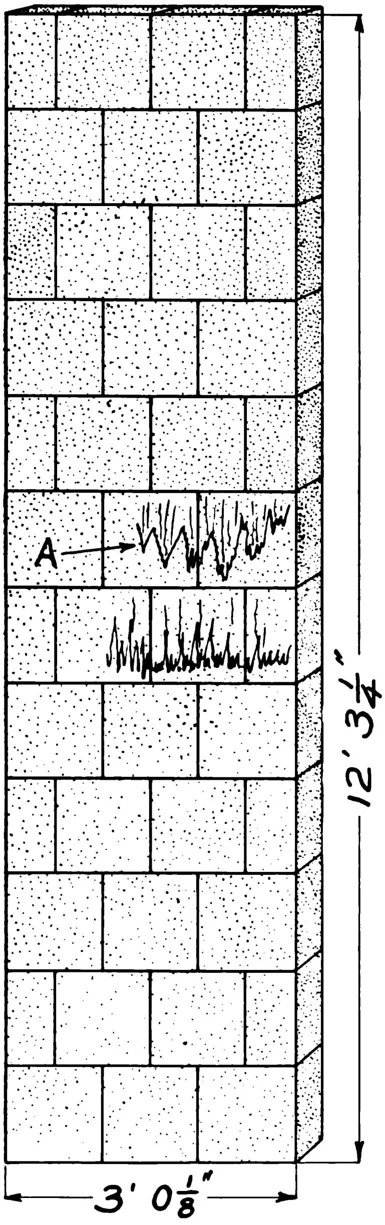
CONSTRUCTION.

WALL BUILT OF POROUS, HOBART, PARTITION TILE – TAKEN AT RANDOM FROM PILE IN THE YARD – PIECES HAVING SIDES AND ENDS BADLY OUT OF SQUARE WERE REJECTED. THIS WAS THE ONLY DISCRIMINATION. TILE LAID UP IN GOOD BRICK MORTAR TO WHICH A LITTLE CEMENT HAD BEEN ADDED.

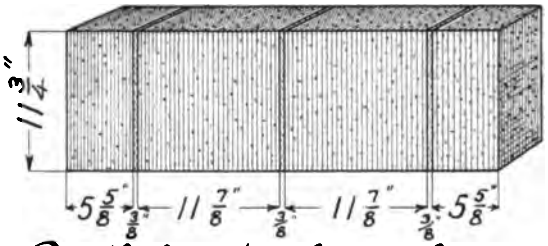
WALL HAD THREE SURFACES PERFECTLY PLUMB.

TEST.

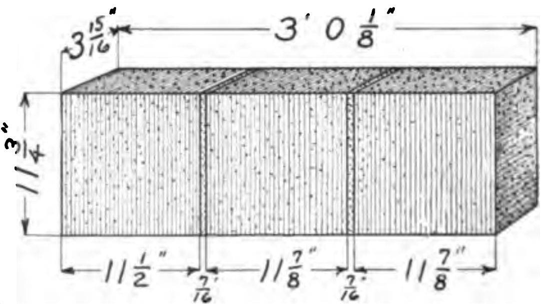
NO INDICATIONS OF FAILURE WERE GIVEN UNTIL 20 TONS WAS REACHED WHEN A SLIGHT BUCKLE WAS NOTICED AND THE CRUSHING AT A AS A RESULT OF THE BUCKLE. AT 22½ TONS A DECIDED BUCKLE OCCURED WHICH CONTINUED UNTIL THE MAXIMUM PRESSURE OF 34 TONS WAS REACHED WHEN FAILURE OCCURED DUE TO A SINGLE BUCKLE AT THE MIDDLE OF THE WALL



Partition Tested.



Detail of 2nd, 4th, etc. Courses.



Detail of 1st, 3rd, 5th, etc. Courses.

Test of Solid, Porous, Tile Partition.

TEST SHEET NO. 1.

W H Rouey C.E.

National Fire Proofing Company
Testing Station
Chicago.

NUMBER OF ARTICLE	WHEN MADE	WHEN TESTED	FIRST SERIOUS CRACK	MAXIMUM PRESSURE	CUBIC INCHES IN WALL	STRENGTH PER SQUARE INCH
1211	8/18-04	11/17-04	90 TONS	90 TONS	12,993.21	1687.12 *

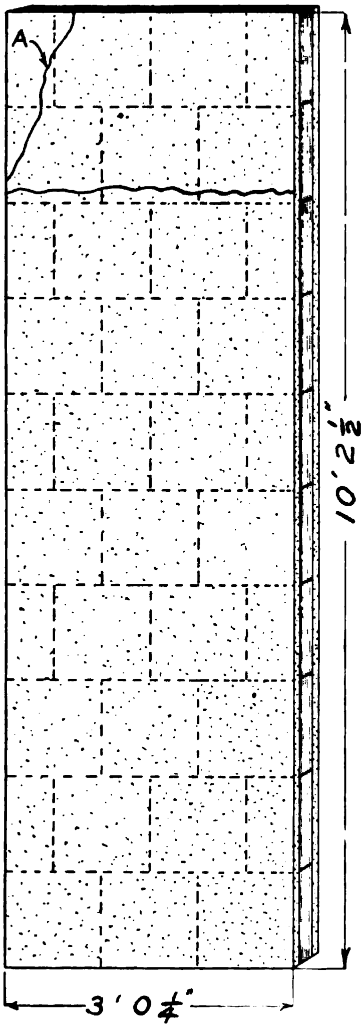
CONSTRUCTION

WALL BUILT OF HOLLOW, POROUS, HOBART, PARTITION TILE TAKEN AT RANDOM FROM THE PILE IN THE YARD. PIECES HAVING SIDES AND ENDS BADLY OUT OF SQUARE WERE REJECTED. THIS WAS THE ONLY DISCRIMINATION. TILE LAID UP IN GOOD BRICK MORTAR TO WHICH A LITTLE CEMENT HAD BEEN ADDED. WALL HAD THREE SURFACES PERFECTLY PLUMB. WALL PLASTERED WITH A CEMENT AND SAND MIXTURE ONE PART "OWL" CEMENT AND TWO PARTS CLEAN SCREENED TORPEDO OR BANK SAND.

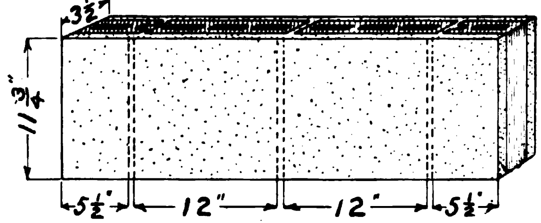
TEST

THIS WALL STOOD THE PRESSURES THAT WERE RUN UP TO 60 TONS WITHOUT GIVING OFF EVEN THE SLIGHTEST SOUND AND WITHOUT SHOWING A CRACK. AT THE PRESSURES OF 60 TONS A SERIOUS SOUND OF CRACKING WAS HEARD. THERE WAS ALSO A SLIGHT SOUND AT 78 TONS. AT 90 TONS THE FIRST CRACK APPEARED AND THE WALL FAILED BY STRAIN ON THE INNER WEBS. THE PLASTER TENDED TO LEAVE THE WALL.

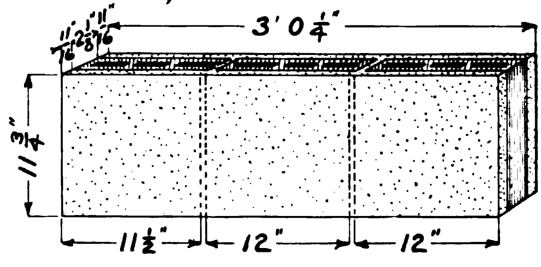
THROUGHOUT THE WHOLE TEST THERE WAS NOT EVEN THE MINUTEST INDICATION OF BUCKLE.



Partition Tested.



Detail of 2nd, 4th etc. Courses.



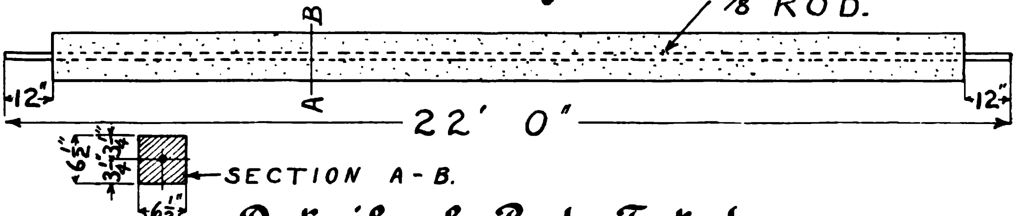
Detail of 1st, 3rd, 5th, Etc. Course.

Test of Hollow, Porous, Tile Partition, Plastered.

TEST SHEET NO. 2.

W K Roney C.E.

National Fire Proofing Company
Testing Station
Chicago.



Detail of Rods Tested.

RODS MADE 9/14-04			RODS TESTED 11/16-04		
TIE ROD NUMBER			2221	2222	2223
FIRE PROOFED WITH			ROCK CONCRETE (1-2-5)	CINDER CONCRETE (1-2-5)	POROUS TILE LAID IN CEMENT MORTAR
FIRE	TEMPERATURE	TIME	EXPANSION	EXPANSION	EXPANSION
SLOW WOOD FIRE		8:30 A.M.			
		9:30 "	.09"	.20"	.11"
		10:00 "	.18"	.36"	.13"
		10:10 "	.22"	.46"	.18"
		10:17 "	.22"	.53"	.19"
		10:21 "	.23"	.58"	.19"
	1742° FAHR	10:25 "	.26"	.62"	.195"
HEAVY FIRING.		10:31 "	.29"	.66"	.195"
	2318° FAHR.	10:49 "	.39"	.88"	.23"
		11:03 "	.44"	1.14"	.28"
	2750° FAHR.	12:00 M.			
FIRST TWO HOURS OF FIRING			PIECES OF CONCRETE READY TO DROP OFF	PIECES OF CONCRETE READY TO DROP OFF	TWO OR THREE TILE LEFT THE BOTTOM OF ROD
REMAINDER OF FIRING			CONCRETE ENTIRELY DESTROYED	CONCRETE ENTIRELY DESTROYED	TILE WORK PARTIALLY DESTROYED

Test for Expansion in Fireproofed Tie Rods

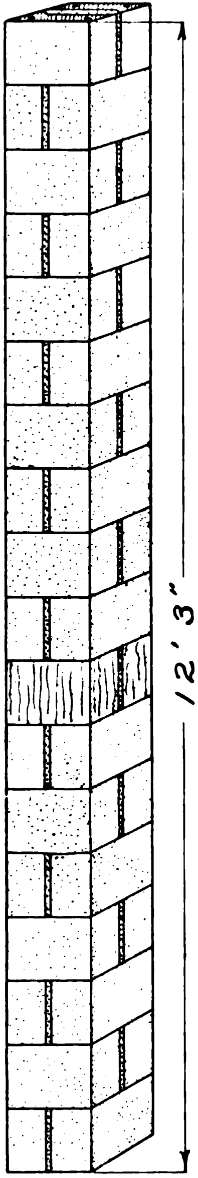
TEST SHEET NO. 3.

W H Roney C.E.

National Fire Proofing Company.

Testing Station, Chicago.

NUMBER OF ARTICLE	DESCRIPTION	WHEN MADE	WHEN TESTED	SQUARE INCHES BEARING SURFACE	FIRST SERIOUS CRACK	MAXIMUM PRESSURE	STRENGTH PER SQUARE INCH
1134	CONCRETE COL	9/15-04	11/16-04	109.392□"	77.5 TONS	77.5 TONS	1416.92#
2312	TILE COLUMN	9/12-04	11/16-04	109.392□"	167. TONS	167. TONS	3053.24#



TILE COLUMN

AT 80 TONS VERY SLIGHT SOUNDS WERE GIVEN OFF. NO OTHER INDICATIONS OF FAILURE UNTIL 167 TONS WAS REACHED. NO INDICATION OF BUCKLE.

CONCRETE COLUMN

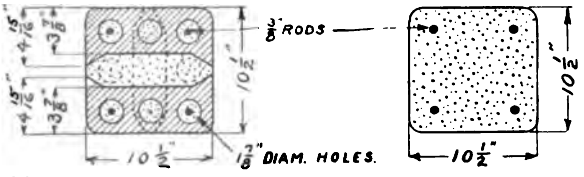
NO INDICATIONS OF FAILURE UNTIL THE MAXIMUM PRESSURE OF 77.5 TONS WAS REACHED, WHEN COLUMN FAILED BY A CRUSH IN THE PLACE INDICATED.

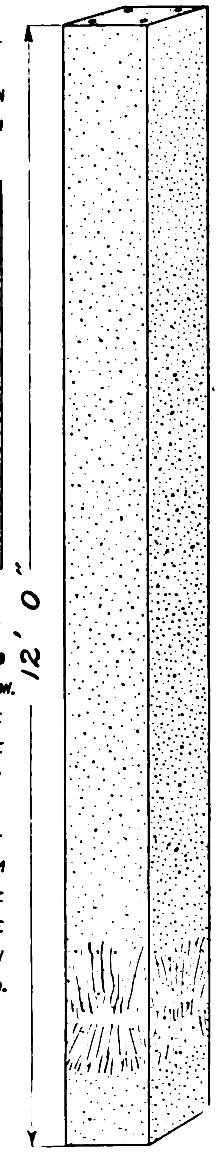
COMPOSITION							
			PROPORTION	%	CU. IN.	WEIGHT	KIND
CONCRETE COLUMN		CEMENT	1	14.93	3445.	171.02#	"OWL" BRAND
		SAND	2	30.71	7086.4	423.92#	½ TORPEDO ½ BANK
		STONE	4	54.36	125417	6498#	¾" LIME STONE
		WATER				157.67#	
TILE COLUMN	MORTAR & GROUT	CEMENT	1	33.33	1400	68.5#	"OWL" BRAND
		SAND	2	66.67	2800	167.5#	½ TORPEDO ½ BANK
		WATER				27.5#	
	GRAVEL CONCRETE	CEMENT	1	11.1	700	34.75#	"OWL" BRAND
		SAND	2	22.2	1400	83.75#	½ TORPEDO. ½ BANK
		GRAVEL	6	66.7	4200	251.25#	⅛" TO ¼" GRAVEL
		WATER				68.75#	

CONSTRUCTION

TILE COLUMN BUILT OF CORNICE TILE, FREE FROM SERIOUS KILN CRACKS AND BREAKS CAUSED BY HANDLING. TILE OF EQUAL HEIGHTS, BURNED TO THE SAME DEGREE OF HARDNESS WERE CHOSEN TO GO IN PAIRS. TILE LAID AND POINTED WITH CEMENT MORTAR. BETWEEN EACH PAIR OF TILE GRAVEL CONCRETE WAS RAMMED. THE REINFORCING RODS WERE SET IN THE HOLES AND GROUTED WITH CEMENT GROUT.

CONCRETE COLUMN BUILT OF STONE CONCRETE BY METHODS USED IN PRACTICAL BUILDING CONSTRUCTION. THE SAND AND CEMENT WERE MIXED AND THEN ADDED TO THE WET STONE. THE ENTIRE COLUMN WAS RUN UP AT ONE TIME, THUS AVOIDING WEAK JOINTS. THE CONCRETE WAS WELL RAMMED. THE FORM WAS MADE OF 2" NORTHERN PINE SECURELY BOUND TOGETHER. THE FORM WAS LEFT ON THE COLUMN FOR 72 HOURS, THEN REMOVED.





Tile Column

Horizontal cross Sections.

Concrete Column

Test of Tile and Concrete Columns.

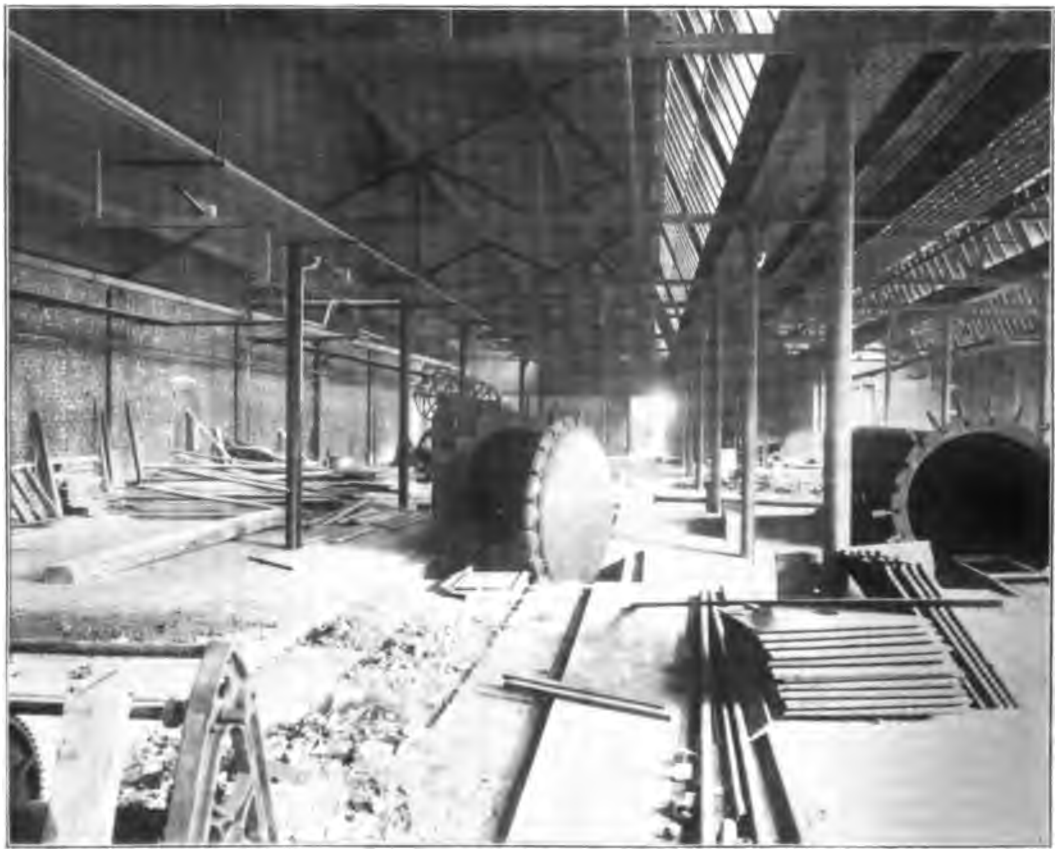
W H Rouey C.E.

TEST SHEET NO. 4.

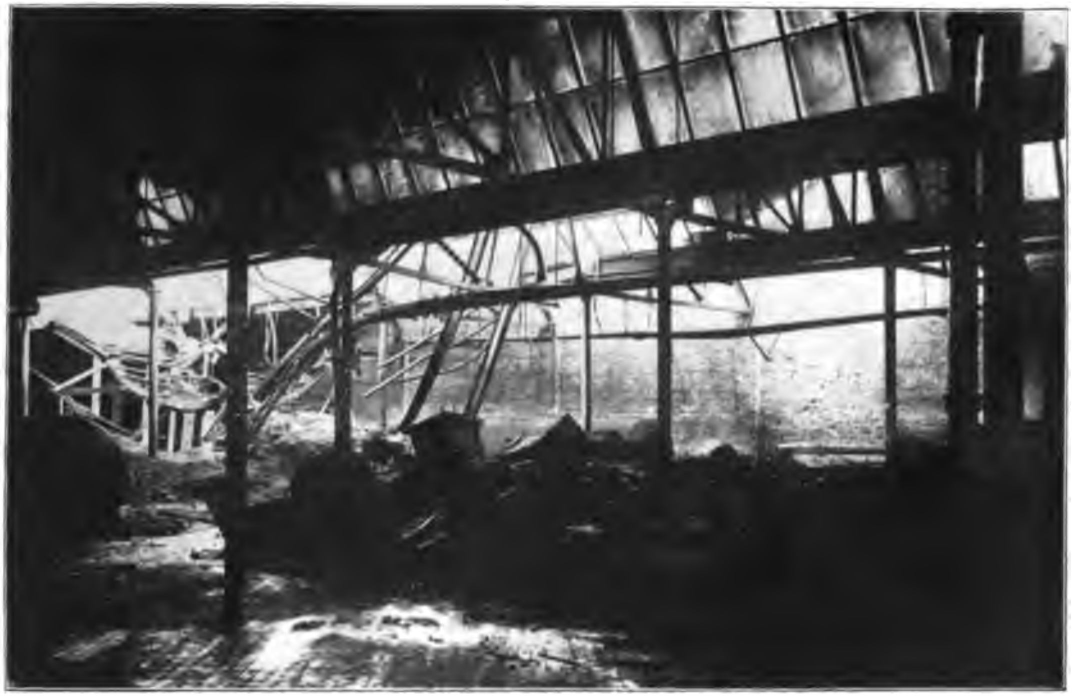
THE FALLACY OF USING INCOMBUSTIBLE CONSTRUCTION WITHOUT FIREPROOFING ILLUSTRATED.

THE illustrations shown herewith demonstrate conclusively the fallacy of erecting factory buildings without providing fireproof protection to the constructive steel. In an editorial in FIREPROOF MAGAZINE for September last the large group of buildings erected by the Western Electric Company at Hawthorne, in the suburbs of Chicago, was mentioned among other buildings then being erected in Chicago, to the credit of Chicago's progress in fireproof construction. But we were careful to mention only one of the buildings in which hollow tile was used for construction purposes and fireproofing. Some of the buildings forming the plant are built according to what is known as the "saw tooth plan," and are one story high. They are also built absolutely of "incombustible" material, and it might be supposed that they were free from danger from fire if their contents were also incombustible. But in January last one of these buildings was very badly damaged by fire; in fact, part of one of them was totally wrecked.

The illustration below shows the interior of one of these buildings as it appeared before the fire: those on the opposite page show the effects of fire on similar constructions. It would seem that there could not have been much combustible material to burn, but the facts show that there was enough to cause great damage. It is needless to add that this could be prevented by

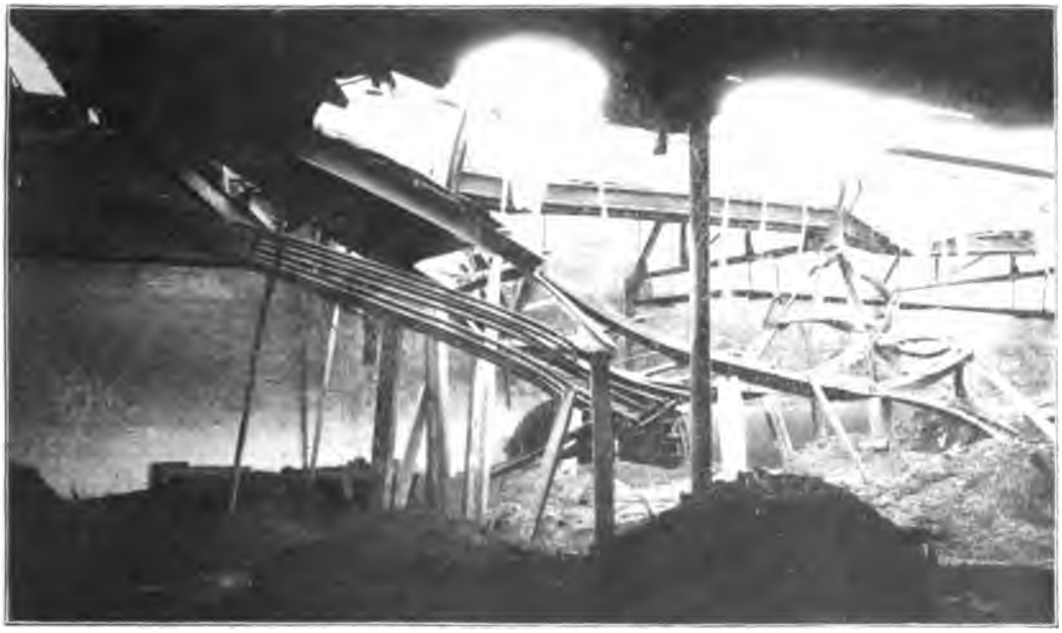


WESTERN ELECTRIC COMPANY'S "SAWTOOTH" FACTORY AT HAWTHORNE, NEAR CHICAGO, BEFORE THE FIRE.



VIEW OF WESTERN ELECTRIC COMPANY'S "SAWTOOTH" FACTORY AFTER THE FIRE.

systems of fire-protection that have been used frequently elsewhere. We have before us illustrations of the adaptation of one of the numerous concrete systems to the construction of a "saw tooth" factory at Philadelphia and know of several in Ohio in which the tile system has been used.



ANOTHER VIEW OF WESTERN ELECTRIC COMPANY'S "SAWTOOTH" FACTORY AFTER THE FIRE.

LAST WORDS ON THE FIRE LOSSES AT BALTIMORE IN FEBRUARY, 1904

IT is now but little more than one year since the great Baltimore conflagration, and the report of the Baltimore committee of the National Board of Fire Underwriters has just appeared, giving in detail the results of the surveys and adjustments on the fireproof buildings which were largely saved from destruction. The reports of the adjusters have appeared and have been commented upon from time to time in FIREPROOF MAGAZINE, but this final report will always be valuable for reference. In general, it confirms all that has been heretofore said in these pages. But *Engineering News* seizes the occasion for presenting a lengthy editorial which raises the question, remarkable at this time, of the "commercial value of fireproof construction" on the basis of certain deductions it makes from the report. It is fair to restate here what those deductions are. It says:

> Taking the evidence as it stands, a fair summary of the fire record of the fireproof buildings that passed through the Baltimore fire is about as follows: The tenant lost all that he had, his loss could not have been greater had he occupied a timber shanty. The building owner lost from 60 to 75 per cent of the sound value of his building. He also lost the income from his property for a period approximating the time required to build an entirely new building. Altogether, then, the total gain from these buildings having been of fireproof construction is a saving of from 25 to 40 per cent of their sound value in materials and workmanship. It is natural enough in view of this showing to find the old question of the commercial value of fireproof construction again being raised.

This looks very plausible, supposing the premises to be correct. But it is misleading if the reader supposes that it is an exact statement of facts to be considered in connection with *the risk* to other fireproof buildings erected all over the country. Whatever truth there may be in it, it only has a bearing upon *buildings surrounded by a general conflagration.* The main fact to be considered by those who own fireproof buildings of similar character is that the six selected by *Engineering News* for illustration are *among the only ones that resisted this conflagration in the least degree,* and that of the twenty-three buildings classed as fireproof on which the loss is given at an average of 56.4 per cent, the percentage covers all the combustible finish, machinery and equipment which were never designed to be, and could not be, fireproof in any sense, the smallest part of which was the real fireproofing and the steel construction. The very figures which it quotes show that the loss on steel structures did not exceed two per cent, and the actual losses on the fireproofing itself, as given in the detailed reports, are as follows, using floor arches for illustration:

Floor Arches.	Sound Value.	Fire Loss.
Union Trust Building..	$13,754	$5,502
Calvert Building........	30,029	2,244
Herald Building........	7,978	3,989

In the latter building the report states that the loss was due mainly to the sagging of the girders, which were not adequately protected, obsolete methods having been used. In all of them every floor arch in which there were cracked tiles was declared a total loss and paid for by the insurance companies, even though many of these arches were afterward repaired and left in place by the owners.

In the following buildings the detail tables class all floors, partitions and protection to construction together as "fireproofing and concrete," nearly all of the partitions being destroyed:

	Sound Value.	Fire Loss.
Merchants' Nat. Bank..	$13,705	$ 9,548
Continental Trust......	63,030	34,136
Maryland Trust.......	14,987	10,559

The Equitable building is left out because nearly all the floors were a total loss. They were such as no one could defend.

The main fact after all is that these buildings stood up against one of the greatest conflagrations of modern times. No one claims that any one of them was the perfection of fireproof construction and finish, but no one can question that *if all the buildings of the burned district had been equally good there would have been no conflagration at all.* The fire would have been stopped in its early stages.

It seems therefore idle, if not foolish, to raise the question now of the "commercial value of fireproofing," or to ask, "Does it pay?" The modern systems used in connection with steel skeleton construction are the only conditions upon which it depends for safety against fire; without them there would be no steel skeletons, no high buildings. All that remains is to go on perfecting them, and of that there are many evidences. It is safe to say that there are already many high buildings elsewhere that are far superior in fire-resisting qualities to those which were exposed at Baltimore.

In conclusion, we quote the five matters to which special attention is called in the committee's report as a result of their investigations, all of which are well worthy of consideration. They are as follows:

(1) Well-burned brick and plain terra cotta are the only materials that stood the heat with any degree of success. Granite, marble and ornamental terra cotta and all kinds of building stone proved a failure when exposed to a fierce heat.

(2) Exposure charges on this class of buildings should be materially increased.

(3) A material extra charge should be made on all buildings built of or faced with granite, marble or any building stone. The percentage of loss on these materials has been exceptionally heavy, and will be so from an exposing fire, even in cases where the loss on a brick building would be nominal.

(4) The question of fireproofing is a serious one. This fire developed a great deal of shoddy work, some of the so-called fireproofing being practically useless, indicating that we have been too lenient in passing inferior materials and poor workmanship.

(5) The claims made, coupled with difficulties encountered in trying to reach a fair adjustment, and heavy expenses incident thereto, would seem to make it imperative that these elements should be considered in future in naming rates. This experience is not confined to Baltimore, having been encountered before, but has been strongly emphasized by events here.

The following remarks by Samuel R. White, who adjusted all the losses on the fireproof buildings, are attached to his report on the Calvert building, but would apply equally well to most of the others:

In making this report I will state some points in construction showing (as I see it) their weak points: The structural steel in this building suffered about 1 1-3 per cent; ornamental iron about 37 per cent; common brick 5½ per cent: enameled brick 7 per cent; face brick nearly 50 per cent, largely caused by being compelled to remove them to replaced damaged terra cotta; the terra cotta was damaged about 74 per cent. The fireproofing in this building was largely of hollow tile. The arches were of end construction and stood well, with a loss of 7 1-3 per cent. The partitions, as you will see, were nearly a total loss, as the wrecking and clearing up nearly equals the salvage. This loss cannot be charged entirely to the fireproofing material, but was caused by the manner of construction and the weakening of the thin partitions in installing the electrical and mechanical devices.

A CHAT WITH BUSINESS MEN

BY F. W. FITZPATRICK.

As an executive officer of the International Society of State and Municipal Building Commissioners, one of whose main efforts is the improving of building methods and the adoption of more thoroughly fire-resisting construction the world over, I find, paradoxical as it may seem, that one of the greatest drawbacks to really first-class construction is the regulations anent construction adopted by the insurance people, well-meant regulations, undoubtedly, but generally misunderstood by even astute business men. These regulations, which, after all, simply cover the risk the insurance people are willing to take, are generally believed to be descriptive of the most perfect building ingenuity can devise. The result is that when you suggest absolutely fireproof construction to cities or individuals you are confronted with the everlasting underwriters' regulations which permit of this, that and the other thing that are far from fulfilling the ideal conditions, but beyond which people do not feel *compelled* to go. Those regulations are almost universally accepted as the basic standard of good construction. A discussion of the whys and wherefores of all this would be out of place here, but it may be stated briefly, however, that if insurance regulations were such as to demand the most perfect form of fireproof construction in every particular, there would soon be no occasion for insurance. Buildings that *cannot* be injured by fire are not prolific premium bearers.

THE INSURANCE QUESTION.

Even the average business man has awakened to the necessity for doing something to prevent the terrible ravages of fire which have swept the country in the past. He is appalled at the figures showing our fire losses, yet there is that old conservatism, or let us frankly call it stupidity, that still enchains him and prevents him from unfettering himself absolutely from the bondage of custom; and he only dares venture a little step at a time and abjectly follows the dictates of the supposedly all-wise constructors, the insurance people. Then, too, the fear of additional expense in building holds him back. So long as he protects his building just a little trifle he can obtain insurance at what he deems fair rates, and he is too short-sighted to go but really a step more and free himself entirely from the necessity of paying tax to the underwriter, while at the same time securing a perfectly safe and profitable investment.

Up to the present the American people have been wasteful, criminally so, in much they have done. As a nation our lands and forests have been lavishly misused, squandered, our mines have been recklessly worked, our great natural resources drawn upon as if they were inexhaustible, and only to-day are we beginning to awaken to the necessity of husbanding them for the morrow. So with our buildings. We have been stupidly trifling with them, spending great sums in lavish decoration, in beautiful embellishment of loose-jointed, flimsy, weak, evanescent skeletons, and the result is that our annual ash-heap has assumed stupendous dimensions.

Everyone has built as cheaply and as flimsily as he dared, in the hope that his property would escape fire, and he has joined in a gamble with the insurance companies on that hypothesis, forgetting that losses suffered by others react upon the entire community, himself included, and enhance the prices of everything to everyone, even the insurance for his protection. The way we have been doing is much like the riotously inclined individual who deliberately sets out on a drunken debauch, but takes a detective along with him for his protection. Of course he has to pay the detective a good fee for his services. So do we pay our insurance protectors a good fee. Obviously, the wiser course in both cases is to arrange matters so that we do not need the protector. Perhaps a few figures will illustrate better than words what our fire debauch costs us. Prior to 1904 for a good many years our losses ran from $170,000,000 down, but in 1904, in these United States of America, $230,000,000 worth of property went up in smoke. Now then, assuming that nearly $200,000,000 were given back to the sufferers by their insurance protectors, these latter companies had meanwhile taken in something over $500,000,000 in premiums that year to cover that loss—and we are assured that, though but one dollar of every three taken in goes back to the insured, there is still very little profit in the business—and we have also paid out, always during 1904, something like $100,000,000 in the maintenance of fire department protection. Owners have also lost tremendously in the way of rents during the rebuilding process after a fire, but tenants have had to pay rent elsewhere, therefore is that not a total loss, as in other cases? But nevertheless, on the basis of rents—people having to move into smaller and makeshift quarters—the actual shrinkage of rental returns for the year must be something like $40,000,000. Figure up the total and note the value of the ash pile.

Talk about race suicide, why, if we are not suffering with a suicidal mania as far as buildings are concerned, I do not know what we can call it. I have the returns of the country before me. In the twenty-one largest cities permits were taken out during the five busiest months for $145,000,000 worth of building, or at the rate of $14 per capita of the inhabitants of those cities. But all this building was not completed during the year. During the year there were actually completed, however, buildings in all our cities and rural districts to the value of $174,000,000.

So, you see, as a matter of fact, on the dollar basis of valuation, our actual losses through fire have been over three times the value, always in dollars, of what has been done in new building during the very busy building year of 1904! Can any such losses as these be suffered by a community without seriously affecting the welfore of every individual? Some may think that this is a question for the economist to wrestle with, but I tell you it is one that every practical business man must face, one that affects his own individual pocketbook, the city he lives in, and the nation of which he is a part.

THE REMEDY.

The cure is simple. Build better buildings. "The insurance companies do not demand it," say you; "the reduction in premiums doesn't warrant it." As time goes on those who heed this advice will prove themselves masters of the situation and the only people who will have satisfactorily solved the problem with profit to themselves. Insurance companies are not in business for their health alone. While many look upon them as more or less charitable in their activities, it can be safely predicated that when there ceases to be a profit in the process underwriting will also cease.

As centers of population become more densely settled and built up so, in spite of the expensively maintained fire departments, fire losses increase, and the burden of fire taxation is proportionately augmented and must be carried by the gambler who risks everything, and by the "conservative" man who only builds as well as the insurance companies insist he shall, share and share alike. The man alone who has emancipated himself from the thralldom of customs and precedents and built a fireproof building can snap his fingers at insurance. "FIREPROOF CONSTRUCTION DOES NOT BURN AND FIRE PROTECTED CONSTRUCTION CANNOT BE DESTROYED"—nor need it be insured.

The underwriters as individuals do and say much in favor of fireproof construction, but when it comes to actually insuring they offer a man absolutely no advantage or inducement to build a perfect building. But to build so, even without the encouragement of the insurance people, does not call for purely altruistic motives, nor even great consideration for the common good. As a cold business proposition, it is the *cheapest* construction that is, the best renting and most profitable investment. This is addressed to the man who proposes to build a store for his goods, or a factory, or a home to dwell in, or an office building or store as an investment. To him the advice is sound, and if he heeds there is not only safety for his investment but profit thereon, far more than he supposes. This is not addressed to the speculator who builds for to-day in the hope of selling to-morrow, and cares not a rap what happens the next day, or what profit there may be to the man he has fleeced. There is no use giving advice to the speculator. He will build only as well as the law compels him to, and he will seek by every means to evade or defeat the purpose of the law. As his class is a large one must our laws be severe indeed. To the rightminded they inflict no hardship. On the Budenseiks and men of that ilk ought they to be severe, and it is these rascals that we hear lamenting about the stringency, the "injustice" of the building laws we are trying to have enacted throughout the country.

If the insurance people really had the public weal at heart and were frankly in favor of perfect construction what a tremendous power for good they might be! We recognize it as our duty, as good citizens, to do whatever we can to diminish the fire danger. A great many cities have succeeded in doing so to a marked degree, but as losses increase elsewhere premiums are increased "flat" and a penalty is exacted from those who have performed their duty in this regard, as well as from those who shirk it altogether. Why, without actually insisting upon fireproof building, they could lessen their and our losses tremendously by using a little common sense in rating and adjustment. Every policy should contain a clause that when a loss originated on the premises of the insured he could recover only 80 or 85 per cent of his loss, whether such loss were total or partial. This would make it an object for every policyholder to see that his own premises were properly protected and equipped to prevent fire from originating thereon. He would be penalized for carelessness, for reaching a man's conscience through his pocketbook is rather effectual. They could do more. They could refuse absolutely to insure extra hazardous risks, made so by the carelessness and negligence of the occupant of a building. Everyone knows that two-thirds of the fires which occur are due to incendiarism, carelessness, preventable defects, and general lack of care, watchfulness and protective appliances. Insurance companies might do that much, even if they will not encourage the erection of fireproof buildings and their proper equipment and protection by making a much greater difference in the rates in favor of the better class of risks.

Will the insurance companies do this? I hardly think so; certainly not so long as there is more profit in letting things drift. Just so long as insurance is not placed under proper governmental regulation, just so long may we expect our annual fire loss to keep on increasing, and our insurance rates will mount higher and higher.

Just like the discriminatory rates on railroads, the "awful meat trust" and all those things that go toward making us so uncomfortable and fretful and contribute so much to the profit of a few at the expense of the nation, this thing can be remedied very easily and quickly by the thinking business men. The remedy is in the hands of the people and will be effective just as soon as they are ready and wise enough to use it. The self-interest of the clever few and the ignorance of the many are what prevent this happy consummation.*

Shipping, interstate commerce and a host of things involving no more important principles or results are made subjects of stringent federal or state control. Why should this interest be exempt from all but the most meager and perfunctory control?

Under proper regulations this question of the insurance premium and due encouragement to better construction would be settled, and even the most short-sighted would realize that it was immediately profitable to build properly. More than that (and the suggestion comes from Canada), taxation upon buildings would diminish pro rata to their fireproof qualities. A sane suggestion. "If a man taxes himself for the benefit of the public it certainly is not fair to him to tax him again on the amount of his own taxation, but it would be quite fair to him and to everyone else to remit taxes to him, on the basis of that account; and inasmuch as taxes should be fluid and level up all hollows in the public estate, the displaced tax should find its settlement on buildings that are below proof in the matter of fireproofing. It is for them and because of them that the fire departments are maintained, and they, and not the property which requires no protection, should pay for that maintenance."

Specious arguments can be advanced against the bettering of conditions. A journal devoted largely to the interests of the insurance companies, in a recent editorial, gives one of the best examples of modern sophistry that has ever come under my observation. It says, summing up its argument against a general improvement in building conditions and the lessening of the fire risks: "Our social system is adjusted so as to distribute the burden of the vast loss indirectly upon the public at large, and more than this, it not only expects to meet these annual losses, but it would be a very serious matter if these did not occur for a series of years. . . . The first year in which no fire occurred there would be general jubilation, fire companies would welcome the rest and stockholders in insurance companies would be happy in increased dividends. . . . Later mechanics and business men would wonder why times were getting so hard. . . . And still later there would be a widespread outbreak of incendiary fires as the first step toward restoring the building industries to their nor-

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*By this I do not mean to say that the insurance people are maliciously and deliberately throwing obstacles in the way of progress in proper construction, though when such progress materially affects one's business even very good people are prone to take a strangely perverted view of their duty in the premises. For instance, the tugboat men of the New York harbor have lately protested against United States vessels rendering assistance to vessels becalmed or in distress without receiving remuneration, because, forsooth, such purely humanitarian actions on the part of the government compete with an established private business. Worse than that, when the government established lighthouses around Key West, Fla., that city protested against the injury such protection would work to the *wrecking* industry!

mal condition. It is fortunate, therefore, that the progress in replacing combustible with incombustible buildings is, and must be, slow!" Comment is hardly necessary, though one little illustration may be of service to those weak enough to be impressed by such an attempt to befuddle as the above. I have in mind a man who built himself a house costing $6,000, two years ago. He had been moderately prosperous and was thinking of building a more expensive home, and had already placed his present house on the market, and with reason expected to make a few dollars out of it on account of the increase in the value of the property. The house has burned down. It was a total loss. He also lost all his furniture, some curios of considerable value, and much wearing apparel, etc. Like most men, he was but "safely" insured, and lost considerably by the fire, besides the expected profit on his sale. He is a man who will not rent a house, so is boarding while building another home upon which he does not feel justified in spending a penny more than he did on the first, in view of the losses he has suffered. So that by reason of the fire our sophisticated editor deems so necessary to keep builders going, the latter have lost the prospective two or three thousand dollars they would have made in the due process of change and betterment ever going on in the world had my friend *not* been burned out.

WHAT IS FIREPROOF CONSTRUCTION?

But I must avoid the temptation of going into details. The first point of this paper, and I think I have made it clear, was that fireproof construction is a national necessity, a national economy, a national duty. Every citizen having the welfare of the country at heart should bear this in mind, and act in accordance therewith. But, and that is my secondly of this chat, a secondly which will take but a few minutes to elucidate, it is not only a man's duty as a citizen, one feeling a proper responsibility for the good of the whole, to build rightly, but also his duty to himself, as a curator of property and life intrusted to his care. Furthermore, it is to his best pecuniary interests to so build, to his immediate profit and the protection of his investment. Following that, my chat will take the form of a few words on the subject of what *is* fireproof construction, as a necessary sequence to the proof that it, whatever it is, is necessary. This is made all the more essential by reason of the fact that the average man cannot be expected to be discriminating in matters about which, necessarily, even his general information must be exceedingly limited. So many things are foisted upon the unsuspecting as "fireproof." We hear of "fireproof wood," of "slow-burning" this, that and the other, "protected" this and "protected" that; fakirs beset the unwary at every step and the word "fireproof" is glibly pronounced and with extreme unction used as the qualifying adjective of a thousand things and systems that have no more real claim to it than have the varnished paper and bamboo houses of China and Japan, though these may be under the special patronage and protection of the god Heyio!

It is every man's duty to protect his own life and the lives of his family and others in his care to the utmost of his ability. Most men are quite willing to perform this duty, particularly the first part, without any insistence on the part of the law. Nevertheless, wise laws are constantly being enacted looking to the proper protection of life. Railroads are the source of a great deal of solicitude on the part of the legislators. People hold up their hands in horror at the terrible loss of life there is in railway accidents, and new regulations and new devices are being brought forth at frequent intervals for the proper safeguarding of passengers. Yet during the year 1904 our American railroads only killed 168 more passengers than there were lives destroyed by fire, or, to be more specific, during that year 6,672 people were burned to death! The morning's paper before me records that yesterday the Casino theater in New York was burned. Less than two blocks from there, at the same time, an apartment house was destroyed; in Chicago a six-story brick building devoted to manufacturing purposes was burned, money loss $600,000; at Lansing, Mich., a dormitory of the Agricultural College burned to the ground, while in Boston the top stories of the Congregational house were gutted by fire.* Now, those are the principal fire items of yesterday's news, and there is a long list of minor ones. In the first case the fire occurred but two hours before a matinee performance was scheduled to begin. Exits from the theater were not of the best; the main floor is a story above the street. Three hours' difference in the time of the fire might have given us a parallel case to that of the Iroquois theater. In the second instance 150 people barely got out of the building in time and saved but the clothes they had upon them. Two hours earlier would have caught many of them in bed—the result may be imagined. As a result of that fire there was a panic in many of the adjacent tenement houses, much furniture was damaged by being thrown into the streets and several people were hurt. In the case of the Chicago building the operatives of the manufacturing plants escaped by unusual presence of mind. In the Lansing fire 110 students asleep in the building managed to escape by some means or other, and so the record goes from day by day. The surprise is not that the accident of fire occurred, but that so many lives were *accidentally* saved! That such lucky accidents do not always occur is evidenced by the appalling figures of last year's catastrophes. Who tells you that in the next fire you and your family may be the victims who do not escape? Are you justified in taking the chances?

From the pecuniary viewpoint fireproof construction, I contend, is a real economy. Eliminating the question of insurance altogether, the depreciation of an ordinarily constructed building, office, store or other business house, amounts to at least one and a half per cent a year, that is, apart from the cost of refurbishing and maintaining the building in presentable appearance; the materials used in its construction are decreasing in structural value to that extent. In houses used for dwelling purposes, apartments and so forth, the ratio is even greater, amounting to even as much as three per cent. These figures represent the average of all the materials incorporated in the building. The depreciation of the essentially structural parts of timber is even greater. It is pretty nearly four per cent per year, while the average lessening of value of a fireproof structure as a whole is scant one-ninth of one per cent and the depreciation of the structural parts, when once properly built, is virtually nil. The constant shrinking and "movement" of wood framing necessitates frequent repair of exterior and interior finish, papering, painting, plastering, etc., even when those parts of the work would otherwise be perfectly presentable, undamaged by mere age. In a fireproof building such things as shrinkage and movement do not occur, I mean in a properly built fireproof structure. In ordinary buildings—a thing few people figure upon—vermin cause quite an additional item of expense. A certain amount of damage is actually done to the building and its contents. The renting value of a vermin infested house or flat, or store, is soon appreciably decreased. The cost of fighting these pests of various kinds is a tax and you will perhaps be surprised to hear that taking a dozen apartment houses, here in Washington for example, the average cost of fighting vermin amounts to three-sixteenth of one per cent per annum. Fireproofing buildings eliminates that. Figure up these comparisons and then note that a thoroughly fireproof building, in its first cost, will rarely exceed the outlay made for ordinary construction by more than ten per cent. In stores and warehouses that diffrence is reduced to five and six per cent. In some localities I have found that there is barely any apprciable difference in cost, while in at least three recent cases, to my certain knowledge, bids taken both ways have developed an actually *lower* figure for fireproof construction than for wood. Of course, there is always an element of chance in taking bids and there is wide room for such differences. You will realize that when I tell you that on a $200,000 building, for instance, all contractors figuring on absolutely the same basis, there will frequently be as much as $20,000 difference between the highest and lowest bids.

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*Mr. Fitzpatrick evidently had but one sheet of the day's paper before him when he wrote this paragraph, for the fire record of the day he refers to shows that fire also destroyed the Schwabacher Hardware Company building in Seattle, $400,000; a six-story wholesale building on Broadway, New York, $50,000; the Pennsylvania Bridge Company's plant at Beaver Falls, Pa., $75,000; the Battle House Hotel at Mobile, Ala., and much adjoining property, loss probably $1,000,000; an apartment house in Detroit, Mich., loss only $20,000, but 24 families driven out into snowstorm, some of them arrayed in but their night clothes.—[Ed.]

MORE ABOUT INSURANCE.

Now, consider the matter of insurance premiums, which we have lost sight of for awhile. Add that to the other difference, and the cost of construction, maintenance, etc., not giving one thought to the additional comfort and peace of mind and satisfaction in living or doing business in a structure that cannot burn, and you will find that even if the first cost of your building is ten per cent more than if built of ordinary construction, inside of twelve years you have an investment of actually less money that brings better returns, a higher and more responsible class of tenants, and that is good (in the natural order and sequence of things, regardless of the actual stability or life of materials) for at least twenty years more of highly productive life than you could possibly expect from a building of any other character. This matter of renting is going to become a serious one. The tenant has discovered that even in what is ordinarily called a good building, one whose structure is comparatively fireproof, a building that even in case of a conflagration will represent only a partial loss to the owner, in that only the combustible finish, decoration and so on are destroyed, he, the tenant, loses pretty much everything, fire makes a clean sweep of his goods and chattels. He is therefore becoming more exacting. He wants to be in a building where not only the structural parts are immune, but where there is small chance of fire spreading and doing him much damage, too. It's only a question of a short time when the owners of buildings that come up to this standard, which is gradually being evolved by tenants, will have the cream of the tenants. These latter are beginning to discriminate. There was a time, and not very many months ago, when a hotel, for instance, that had some wire lath on its wooden partitions and a few other such makeshifts could boldfacedly advertise that it was "absolutely fireproof." To-day many traveling men positively decline to go above the second story in anything but a really first-class fireproof hotel building, one that they *know* is at least not liable to be fireswept in the twinkling of an eye with them in it like a lot of caged rats.

Of course, if you are building something that you intend selling just as soon after it is erected, "while it looks good," if you are of a speculative class of builders, if you want to get rich quickly and are willing to take chances on the lives and properties of others to attain your worthy ends, why, all this has no interest for you.

WISCONSIN AWAKE TO THE IMPORTANCE OF FIRE PROOFING ITS PUBLIC BUILDINGS

In FIREPROOF MAGAZINE for November, 1904, we published an article on the "Fireproofing of Public Buildings," by C. M. Mayers, which had special reference to the buildings of the University of Wisconsin at Madison. The state of Wisconsin, which recently lost a large part of its capitol building by fire, is evidently alive to the importance of taking greater precautions hereafter, as will be seen by the following extracts from a letter of the correspondent of the Green Bay (Wis.) *Advocate* at Madison:

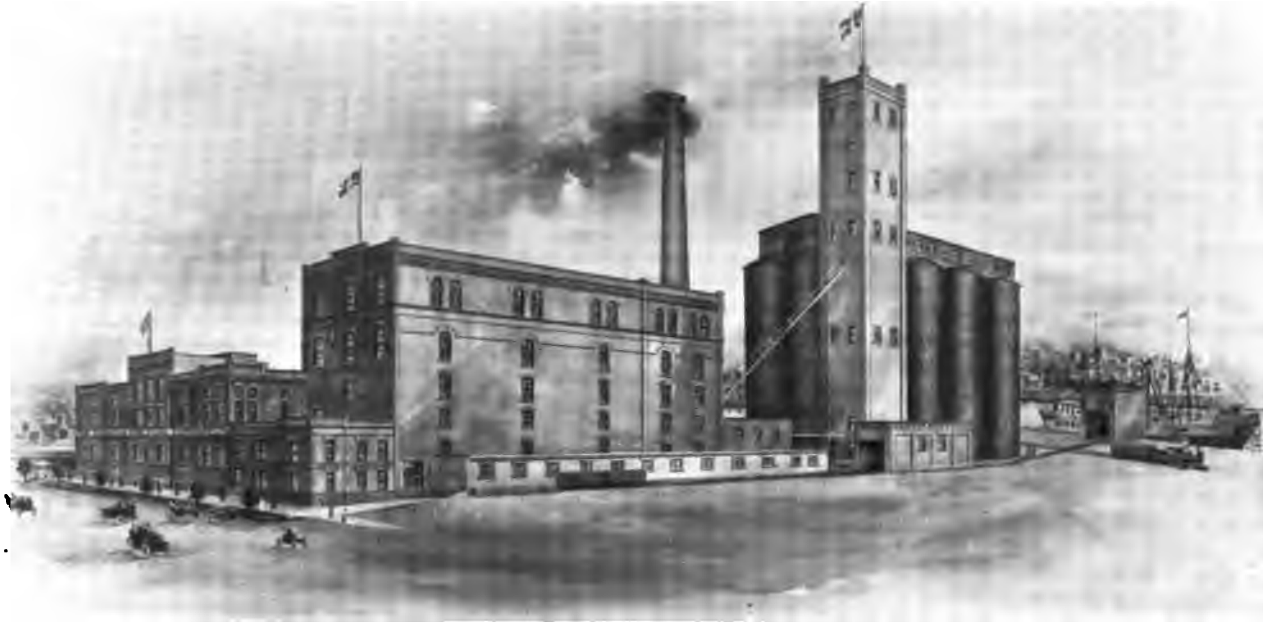
To provide for the erection of none but fireproof buildings by the state is the purpose of a bill now being drafted at the suggestion of certain members of the state board of control. The necessity for such a law is not a new discovery, but the importance of it has been emphasized by the general agitation all over the United States for better protection against fire in all public buildings since the disastrous fire in the Iroquois Theater in Chicago.

An investigation conducted by those interested in the proposed bill has disclosed a condition involving danger to human life and possible loss of state property, which is little less than appalling. Not a single one of the state's buildings at the charitable and penal institutions is absolutely fireproof, and there are only two of the university buildings which are not as highly inflammable as the ordinary old-style office or store building. The lives of all the 3,3co inmates of the various state institutions are endangered by this condition. Likewise, the 100 women students rooming in Chadbourne Hall of the University of Wisconsin are in peril. In addition to this, every student at the university who attends classes in any of the old ramshackle buildings on the campus shares in a measure the same danger. On the same basis all the buildings of the charitable and penal institutions, valued at about $3,500,oco, and the university buildings, valued at a little less than $2,000,coo, are in danger of destruction by fire.

Allan D. Conover, a member of the state board of control, said in an interview:

"The situation is little less than appalling. It is a legacy which has been left the state by former boards of regents and boards of control which have not had the courage to ask the legislature for sufficient appropriations to permit the erection of fireproof buildings. Outside of the cell wings of the prisons, the state has no buildings under the care and charge of the board of control which are fireproof. Some of the buildings are nothing but old firetraps. Some of later construction are a little better, but not what they should be. The buildings, for the most part, have wooden joists and studding, lath and plaster, and a general construction which makes them highly inflammable. The state hospital for insane at Mendota is still covered in part by a shingle roof. The same thing is true of other buildings. The state school for deaf at Delavan, the home for the feeble-minded at Chippewa Falls, the northern hospital for insane at Oshkosh and the state school for dependent children at Sparta are all in bad shape. The home for the feeble-minded is perhaps the best equipped for fire protection of any of them, but it is not fireproof by any means. The school for dependent children at Sparta is nothing less than a nest of firetraps. Most of the cottages there where babes and children are housed are of brick veneer and could be wiped out by a fire starting in any of them. The board has done what it could to remedy this condition, but has been limited by the small appropriations allowed by the legislature.

"Ladies' Hall at the university is another firetrap. When the hall was rebuilt at a cost of $80,000, it should have been made fireproof, but the smallness of the appropriation would not permit. In my opinion the state is badly in need of a law providing that hereafter all state buildings shall be as nearly fireproof as modern science can make them. This policy is followed in Iowa and Minnesota. It should be apparent to anyone, in the light of what has happened during the last few years at asylum fires, that the state's wards should be housed in fireproof buildings."



PERSPECTIVE VIEW OF THE NEW FIREPROOF PLANT OF THE CANADA MALTING COMPANY AT ST. HENRI DE MONTREAL, QUEBEC, NOW BEING ERECTED BY THE BARNETT & RECORD COMPANY.

NEW MALTING PLANT OF THE CANADA MALTING COMPANY

THE illustration on the opposite page shows the plant of the Canada Malting Company at St. Henri de Montreal, Quebec, when completed. The malt house was designed by the architect of the Saladin Pneumatic Malting Construction Company, at Chicago, and the elevator and grain tanks by the Barnett & Record Company at Minneapolis.

The malt house occupies a ground space 115 feet wide by 200 feet long, a portion of which is six stories high. It is of fireproof construction throughout. The materials used are concrete for the foundations, brick for the walls, steel frame with terra cotta hollow tile floor arches, and finished concrete floors. No combustible material of any kind will enter into the construction or finish.

The storage part of the elevator consists of twelve tile tanks built in cylindrical shape, with a brick working house occupying one corner. The total capacity of elevator is 450,000 bushels. The working house is equipped with cleaning and elevating machinery and all other necessary machinery for the rapid handling and cleaning of both barley and malt. Arrangements have been made for receiving grain direct from cars, also from the Lachine canal by the use of floating elevator. This elevator discharges the grain into a small receiving hopper and from this it is discharged into a portable car, running on the same rails as those used by the railroad cars, and conveyed to the elevator. The tanks are constructed after the patents known as the Johnson-Record Tile Grain Storage, the same as those of the Port Arthur elevator described in the October number of FIREPROOF MAGAZINE.

No expense has been spared in the designing and building of this particular plant to make it equal to or better than any other similar plant in this country, and no doubt it surpasses anything in Canada.

The machinery has been designed to give the greatest efficiency with the least amount of labor, and when the plant is complete, which will be within the next thiry days, it will represent an outlay of about $300,000. The fireproofing is so complete that no part of the plant is a menace to any other part.

REPORT OF ALFRED STONE, DELEGATE TO THE UNDERWRITERS NATIONAL ASSOCIATION ON THE NATIONAL ELECTRICAL CODE, TO THE 38TH ANNUAL CONVENTION OF THE AMERICAN INSTITUTE OF ARCHITECTS AT WASHINGTON, JAN. 11, 1905

To the members of the American Institute of Architects:

In making report of the meeting of the Underwriters' National Association on the National Electrical Code, held in New York December 7th and 8th, 1904, your delegate would again call attention to the value of the work done at these annual conventions and the still greater value of the work of its committees and of the investigations made at the laboratory of the National Board of Fire Underwriters at Chicago under the direction of W. H. Merrill, Jr., whose thorough, patient and intelligent series of tests and publication of the same have done so much to raise and maintain the standard of electrical construction.

The semi-annual publication of the list of Electrical Fittings examined by the laboratory and approved by the Underwriters' National Electrical Association has been of inestimable advantage in that it gives a reliable list of the best obtainable devices manufactured in accordance with the standards given in the National Code, a list so reliable that one can safely use in electrical installation any article named on the approved list, provided it bears the manufacturer's name or a distinguishing mark as directed, and can with equal safety reject any material not on the list or not properly marked, one precaution only being necessary and that is that the last edition be used. This precaution is necessary as the requirements of the Code grow more stringent as experience shows that they should be, and because uniformity is constantly sought where possible. To cite but two examples:—

I. As an illustration of more stringent requirements; the construction of switches with reference to distance apart of the two poles, according to voltage and amperes carried, the strength of their parts, their construction to ensure automatic opening when the current is shut off, etc.

II. As an illustration of uniformity:—the construction and standardizing of fuses, by enclosing them to secure immunity from danger of fire from hot metal, having them so made that all fuses of the same voltage, no matter who makes them, shall be of the same color or have some other equally distinctive mark and shall be of the same length and size, making it impossible to put in a fuse of the wrong capacity and enabling any one, whether he has a knowledge of electricity or not, to purchase the proper fuse of any dealer carrying a stock of fuses, no matter whose make he may sell.

Sometimes reasonable complaint is made of the interpretation of the rules of the Code by local inspectors, and it is only within the last year that this difficulty has been overcome, the underwriters having created a board to which appeal can be made. This board will consider all complaints, hear both parties and decide whether the underwriters will insure buildings if constructed as proposed or whether they will uphold the objections of the local inspector and thus necessitate a change in construction.

The importance to our clients of establishing rules and adhering to them can readily be seen when we reflect that in order to secure low rates of insurance, in fact any insurance, conformity of the Code is a necessity and is so great a necessity that the requirements of the Underwriters is of more importance and will be more willingly conformed to by our clients than the requirements of municipal building laws, as the latter are compulsory, while the former appeal to the pockets of the owner. It, therefore, seems expedient, having in view the interests of our clients and our own interest, to continue our representation at these annual conferences which are very fully attended by representatives of the great electrical manufacturing concerns like those of Edison, Westinghouse, General Electric, etc.; by contractors for installing electricity in buildings and for the erection of electrical plants, by local inspectors, members of the American Institute of Electrical Engineers, American Society of Mechanical Engineers, American Street Railway Association, National Association of Fire Engineers, representatives of the Underwriters and the American Institute of Architects, whose delegate I have had the honor to be for nine successive years.

To appreciate what has been accomplished since the first attempt was made at the conference in New York in March, 1896, to bring about uniform requirements and practice throughout the United States by establishing a National Electrical Code, it is only necessary to recall the utter chaos and inability to know what would be required in different localities at that time, and compare it with present conditions, which are not yet perfect. Owing to the personal factor, the rules of the Electrical Code are not even yet uniformly interpreted by all inspectors, but this difficulty is, however, now overcome by the creation of the board of appeal before referred to, whose decisions are final and will soon create precedents and rulings which will abide, to which inspectors will have to conform, and can therefore be relied upon.

Your delegate in closing, appreciating as he does the importance of the rules embodied in the Code for securing proper electric installation, and that to nobody do they appeal with more urgency than to the architects, presents a resolution favoring a continuance of the practice of giving the president power to appoint a delegate from the Institute, and urges its adoption.

The following is the resolution which was adopted by the convention:

Resolved, That the American Institute of Architects hereby authorizes its president to appoint a delegate to represent it at the meetings of the conference on the National Electric Code during the year 1905.

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FOR SAFETY

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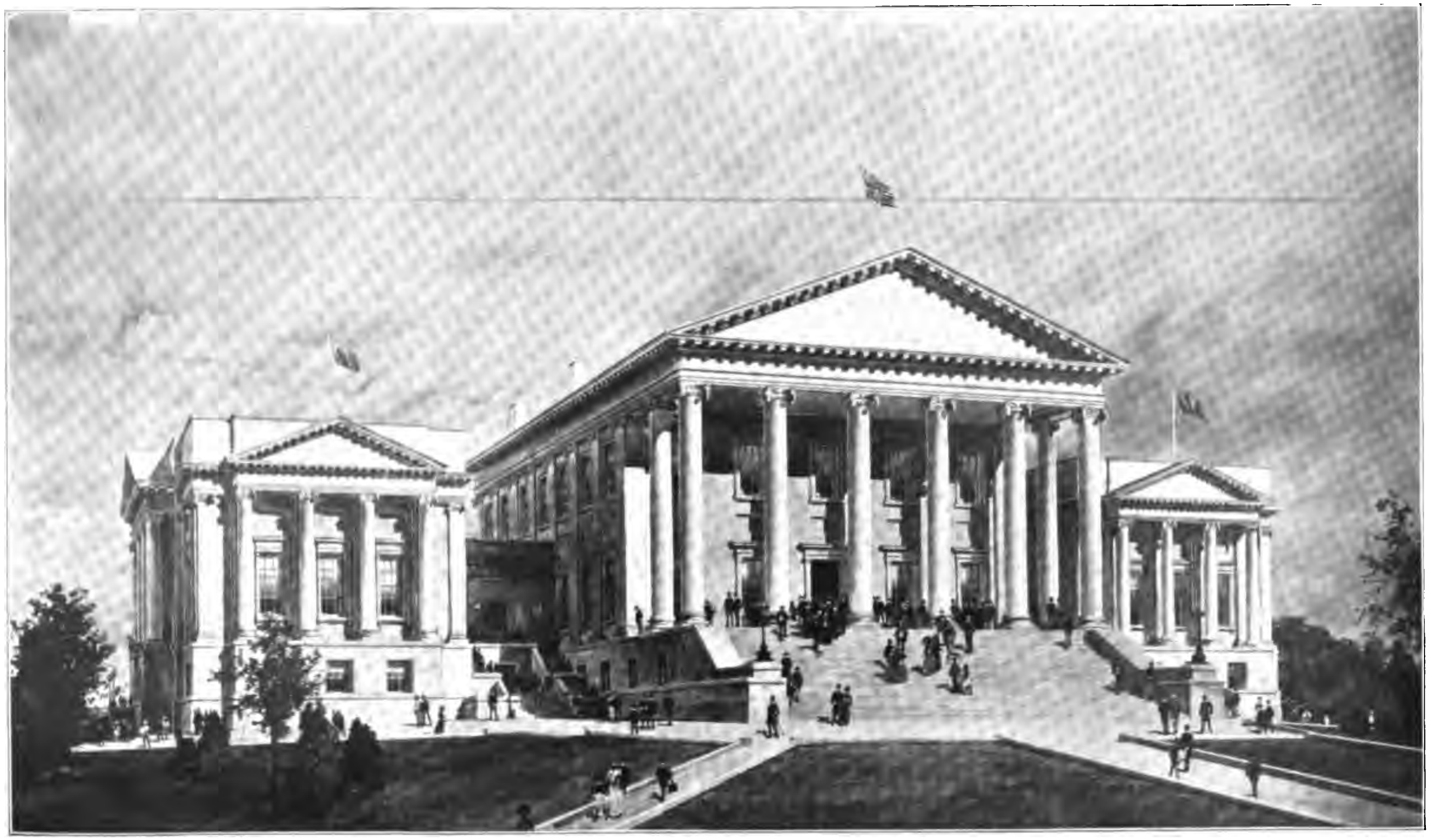

NEW CAPITOL BUILDING FOR VIRGINIA AT RICHMOND.

Nolan & Baskerville, Architects—Frye & Chesterman, Associate Architects—Contractor, W. A. Chasterman—Fireproofing by National Fireproofing Company.

FIREPROOF MAGAZINE

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Great Northern Building, Chicago

CHICAGO'S NEW BUILDING ORDINANCE

Chicago has a new building ordinance. That is to say, that at a meeting of the city council, held March 13, a consolidated building ordinance embracing the main features and constructed on the same plan as the ordinance of 1898, with many additions and improvements, as well as the tenement law of 1902 and the theater ordinance of 1904, was finally adopted.

The new ordinance is the result of the work of a commission consisting of three aldermen, with Alderman Ehemann as chairman, six architects of more or less celebrity and experience, and Building Commissioner Williams. They were appointed in July, 1904, and have been working on it with more or less industry since that time. It was introduced in the city council on February 26 and first given to the public in the printed proceedings which appeared March 1. Its passage on the 13th marks a celerity in municipal legislation almost without a parallel, considering the fact that it is the most voluminous ordinance ever passed in that city.

It cannot be said, however, that it was rushed through, or that there was any occasion for so doing. Outside of the commission very few people seem to have considered that it was any of their business. Neither of the three architectural organizations or the many builders' organizations that exist in that city, not even the Real Estate Board, which generally rushes into the ring on the least provocation, as they did disastrously to themselves when the anti-smoke ordinance was up—gave it any consideration. They accepted it through faith in a commission deemed to be entirely competent for their work.

This left the field open for the rival fireproofers to fight their battles in the few days permitted to do anything at all. And not only were the fireproofers interested, but also those who furnish materials used by fireproofers, such as cement and broken stone. There did not seem to be anybody in the contest representing the producers of cinders; for what interest would it have to those who give away their product? But a great howl was made by the users and recipients of the free cinders.

The whole cause of this eruption was Section 904, which said: "Cinder concrete and machine or hand pressed concrete bricks or blocks are not considered in this ordinance as a fireproof material for the protection of metallic structural members."

In Section 903 also, which describes the materials to be used in, and composition of, concrete to be used for fireproof construction, protection or armored or reinforced concrete, no mention was made of cinders.

Two of the aldermen lead the fight for cinders and hurled their anathemas against all kinds of trusts that were accused of conspiring with the experts on the commission to keep out such a popular building material as cinders. The only wonder is that they did not call it the "poor man's material," since it costs nothing but the cartage. But we were spared that plea and it was unnecessary, for by a vote of 32 to 23 cinders were declared to be an incombustible material and suitable for all kinds of concrete for fireproofing purposes.

The ordinance as presented admitted hard concrete in reinforced construction, as well as all the standard material made of burned clay, and only discriminated against cinders.

.But this performance of the city council will have no effect upon the character of the fireproof buildings to be hereafter erected in Chicago. The models of good fireproofing, which in that city date back twenty years, were not the result of requirements of city laws, but the outgrowth of the demands of Chicago capitalists and the ability of Chicago architects, assisted by experts in fireproofing, to comply with them. All the perfected clay systems had their birth and development in that city, and will continue to be used in the best structures. There is already enough good hard concrete fireproofing there also to demonstrate by comparison that cinders are only a cheap makeshift.

One of the reasons for the desire of the aldermen to pass the ordinance was that it might be printed with the "Revised City Ordinances," that have been approved and are to be published during the present year, the first since 1898.

We had hoped that the commission would have seen fit to recommend the Cleveland ordinance, or at least adopt its admirable classification. It has, however, adopted many features of that enactment, but was obliged to graft them onto the old Chicago form.

It is our intention to print from time to time those parts of this ordinance relating to fireproof materials and construction, as we did in the case of the Cleveland law. At this writing the corrected copy is not available, but the publication will commence in our May issue.

MUCH ADO ABOUT NOTHING

A small blaze that occurred in the Chicago Stock Exchange building on the night of March 13 furnished an illustration of the "frenzied" methods of the daily newspapers and their fire reporters in dealing with fires in fireproof buildings. Every newspaper in that city had a column the next morning, and another column the following morning, to say nothing of the evening papers, with their photographic illustrations. Yet in not one of them have we seen any mention of the fact that the Stock Exchange building is one of the best and safest fireproof buildings in the world, and there was no occasion for anyone to be alarmed. Most of these reports referred to the terrific panic and hairbreadth escapes of the 100 telegraph operators working on the thirteenth floor at 10 o'clock at night, and two women employed in the building, one of whom fainted after she was taken out, because of what she supposed might have happened.

After the fire and excitement had been subdued our representative called at the building and had considerable trouble in finding where the fire had been. This was only revealed in a hole, about two feet square, which had been cut in the thirteenth story through the eight-inch brick wall surrounding the "pipe shaft." On one side of this hole was seen the four-inch stand pipe, where the branch from the "tee" into the telegraphic operating room had been broken off by the expansion of the stand pipe, because the branch had been built into the brickwork and could not move. This was an important discovery and points to the danger of building in stand pipes in high buildings, whose usefulness may be destroyed by such an oversight.

Whatever fire there may have been in the shaft, which could only have been in the cable wrappings and waste oil from elevator machinery, must have burned itself out before they got the hole through the wall, for it takes some minutes to cut through such a wall. Our observer saw no evidence of fire, or any evidence of water having been used. Everything was in order in the large operating room and all the operators were at their keys. There was absolutely no damage outside of the shaft.

The shaft had been built in the best manner to prevent any damage from such a fire, and the expected happened. It is built of brick from bottom to top and has a ventilator at the top which took away the smoke. The observer saw nothing but the hole in the wall and men mending wires inside. All the elevators whose cables are carried in the shaft were in operation. An examination of the attic above showed nothing but fire-protected construction and a roof made of hollow clay tiles. There was not a bit of combustible material or contents in sight. That is what real fireproofing means.

The building is very creditable to the late Mr. Adler and Mr. Sullivan, who were the architects. It is all fireproofed with hollow tiles, except the first floor, which is of hard concrete, lined on the bottom with marble slabs to form the basement ceiling.

THE NATIONAL COMPANY'S TESTS CONTINUED

The "Test Sheets," Nos. 5 and 6 (see pages 178 and 179), showing the results of the continuation of tests of the strength of fireproof materials made by the National Fireproofing Company at Chicago, demonstrate some interesting facts. They are both of them tests of the vertical strength of hollow hard tile partitions. No. 5 is a section of a 4-inch partition 3 feet long and 12 feet high, such as is generally used in fireproof buildings, the tile being set on end. No. 6 is also a partition of the same length and height, but is twice as thick, and the tiles are laid on their sides. These tiles are not usually employed for partitions, because they are unnecessarily heavy, but are used in constructing the exterior walls of factories, dwellings, barns, dairies and ice houses. In both cases it will be noted that the first indication of yielding was at half the pressure necessary for complete destruction, which bears out the belief long maintained as to brick walls and piers, that they will give notice when half the destructive load is applied.

An illustration is also given of the relative strength of end pressure and side pressure hollow tiles. It shows that the resistance to end pressure is about 50 per cent greater than to side pressure for the same unit. It will also be noted that neither of the samples buckled, they merely crushed; and that the side pressure tiles were first crushed in the horizontal shells and webs. These are only a few of the elements which will be discovered if one studies the test sheets carefully.

PROFESSIONAL ETHICS IN BOSTON

When architects come together, questions regarding professional ethics seldom arise. Architects are altogether too sensitive about the possible clashing of their personal interests. Not so in Boston, however. The Boston Society of Architects recently revived the discussion of the evil practice of volunteering to clients sketches or other professional assistance before being actually engaged, for the purpose of securing employment. The society referred the matter to a committee, which recommended the adoption of the following admirable rule:

> "This Society is not a trust or trade union, and does not fix rates of charges to be made by its members. It has, however, recommended to architects and to the public a schedule of charges that, through long experience, have been found to be the minimum rates that yield a reasonable profit. Any member whose skill permits him to obtain it may reasonably charge more. Those who charge less break the lowest remunerative price and act contrary to the interest of the profession, and in the long run to their own interest.
>
> "The regular rates of commission do not cover competitive work to obtain employment. This should be paid for separately. If such work is done without charge the result is the same as the charging of less than the schedule rates, and is in the same way undesirable and undignified. Such practices diminish the usefulness of architects as unprejudiced advisers and lower the standard of the architectural profession."

In a paper read before the Engineers Club of Philadelphia by Washington Devereux, on "Some Causes of Fire," he gives the following statistics of the causes of fire in Pennsylvania in 1902:

"Among some causes of fire in Pennsylvania in 1902, with the resulting losses, might be mentioned, ashes and hot coals, bonfires, candles, and children playing with matches, $74,375; cigars, cigarettes, and pipes, $132,625; collisions (rail), $199,600; defective flues and heating apparatus, $1,712,300; electric wires and lights, $447,795; explosions from gas, gasoline, etc., $346,045; engines and boilers, $44,650; forest fires, $157,950; friction in machinery, $218,230; furnaces, $127,705; gas jets, $128,405; chemicals, grease, oil, paint, and varnish, $42,670; incendiarism, $1,790,875; lamp and lantern accidents, $180,210; lightning, $373,630; matches, $157,850; oil stoves, $212,086; sparks within buildings, $451,690; sparks from locomotives, $119,885; spontaneous combustion, $574,970; defective and overheated coal stoves, $660,405; tramps, $162,665; unknown origin, $3,875,260."

In an editorial in our March issue referring to the new Pittsburg Terminal warehouses, we stated that Mr. Charles Bickel of Pittsburg was the architect, and Messrs. Kindel & Glaffey were the engineers. We should have said that *Kindl & Glaffey* were the engineers for the power house connected with the warehouses. Mr. Bickel, the architect, is solely responsible for the construction of the warehouses and they reflect great credit upon his constructional skill.

A CHANCE FOR IMPROVEMENT

BY J. C. C. HOLDING.

THE question of bracing is of great importance in the design of any framed structure, but one which, with a given set of conditions, admits of diversified treatment. Engineers and architects are unanimous in their agreement that a steel frame should be braced in vertical planes to insure stability in that direction and in horizontal planes to prevent distortion in plan, but what constitutes sufficient provision for these strains is a matter upon which agreement seems impossible.

Considerations other than the purely theoretical requirements of the case will often prejudice the engineer in favor of a less effective system of bracing than he would otherwise permit. For example, the vertical bracing is usually a weak point in the design of a mill building, because of the necessity of preserving an unobstructed interior for the free operation of traveling cranes or other machinery, while, because of the abundant opportunity for treatment offered by the plane of the bottom chords of the trusses, the horizontal bracing is usually designed to meet the most extreme requirtments.

On the other hand, in a building of the steel cage type, vertical rigidity is the natural result of the floor framing and can be increased or diminished according to the judgment of the engineer or architect by varying the depth and number of beam and girder connection brackets. The tendency to twist in a horizontal direction, however, is not usually guarded against along theoretical lines, because provision for it in the steel frame itself is often omitted, partly on account of its interference with the terra cotta floors, and partly on account of the difficulty of designing a practical detail for the construction.

This is all based upon the idea of the skeletons standing alone, which is practically true in the case of the mill building, but far from the actual condition in the case of the office building. The former has usually no solid floors nor masonry walls to take up any of the stresses, while the latter has these things to rely upon for greatly increased stiffness in all directions. It is this very feature of the latter type of building which causes the disagreement among architects as to how much provision should be made in the steel frame for taking care of the wind stresses, etc. If the skeleton of such a building were designed to stand alone it would undoubtedly require a complete system of horizontal bracing at each floor line, for the floor beams themselves are effective in this respect only to the extent of the value of the rivet heads in their connections. They are usually at right angles to the sides of the building and do not come into play as direct tension or compression members when the building is distorted by twisting.

The building laws of some cities require that adequate provision be made in the steel construction itself by introducing diagonal members at the various floor levels to take up these stresses.

One notable example of buildings designed in line with this requirement which has come under the writer's personal observation is the Land Title building of Philadelphia, erected within the last two years. In this building flat bars, six inches by three-eighth inches were used as horizontal diagonals at every floor level in certain panels throughout the building, forming a complete system of rigid triangles. These flat bars were riveted at each end to gusset plates provided on the ends of beams framing into columns. As the floor beams were naturally not all flush on top, the question of making practical details for the connection of these bars was at times a serious one. Recourse was had to various devices, such as brackets riveted to the webs of the beams. This, however, greatly complicated the beam details which would otherwise have been exceedingly simple. The lengths of the diagonals themselves, center to center of end holes, were computed and, by direction of the architect's engineer, these distances were slightly shortened to take up the play in the holes, as is customary in detailing the diagonals of a viaduct or other similar structure.

When the building was erected great difficulty was experienced in getting the bracing in place and a large amount of field work was made necessary in the way of drilling new holes where those already provided did not match. The same trouble was met on all floors and it was, in all probability, due to the braces having been left out until the erection had proceeded too far to permit of the columns being drawn into their absolutely correct positions. They might have been forced into place, but, in the judgment of the erectors, such procedure was not advisable on account of the probability of causing other and more serious troubles. Claims from the owner against the erectors and steel manufacturers for extra expense of erection on account of these unlooked for obstacles resulted and added their share of annoyance. A part of the trouble would, of course, have been avoided had the connection holes in one end of each bar been left to be drilled in the field, no attempt being made to locate them on the detail drawings.

The difficulties mentioned, however, are samples of some of the considerations other than the purely theoretical ones which are likely to influence an engineer's opinion as to whether such bracing is necessary or not. They tend to convince him that the substantial character of the fireproof floor arches and the comparatively short distances from floor to floor furnish sufficient reason for the omission of elaborate systems of horizontal bracing in buildings of this character.

Admitting that, viewed from the apparently safe and reassuring ground of past experience, there is no need for apprehension as to the stability of modern buildings, there is, nevertheless, no doubt that engineers will at some not far distant future time be better satisfied with their designs, because, in the meantime, some genius shall have developed a method of providing, with mathematical exactness, for the vertical moments in the one case and the horizontal moments in the other.

THE SKYSCRAPER

[BY COURTESY OF THE CHICAGO TRIBUNE. COPYRIGHT, 1905.]

First the dream of a man—and then
The days and nights of a thousand men.

You who saw it arise, you know
  How the girders were woven in,
Up and over and to and fro—
  As a spider had huger kin
That were weaving a web of size
Which should swing from the bending skies.

We know, too, how they interlace—
  Brick and granite and steel—ah, yes,
These were hurried each to its place,
  Shaped and blended in comeliness,
Formed and finished in massive grace
True and perfect from roof to base.

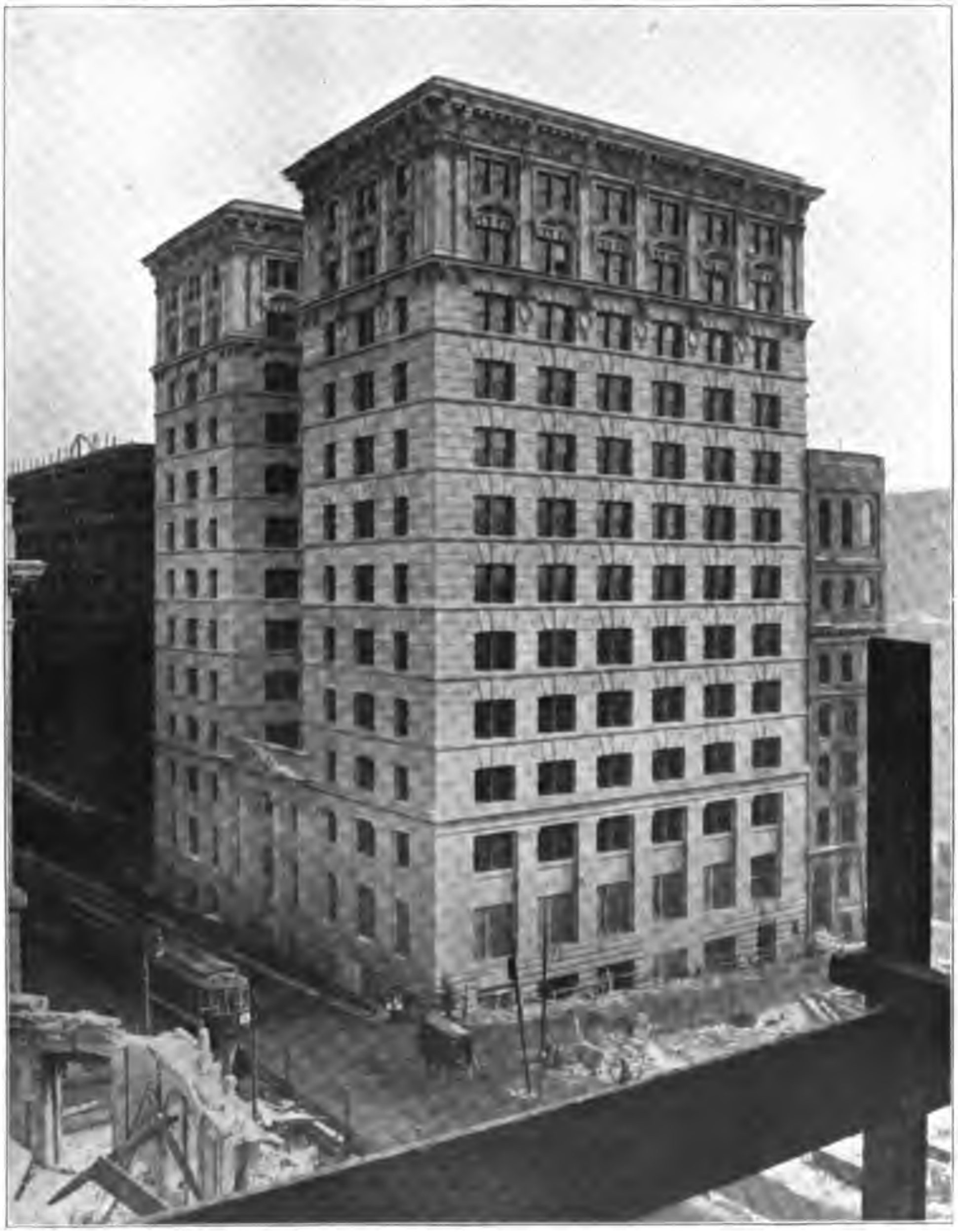
Roof and window and wall and floor—
  You have seen them, and see them now;
They the structure—but is there more?
  Is there nothing to tell somehow
Of the burdens that builders bore,
Of the callous their fingers wore?

Rich mosaic beneath your heel—
  And the building is builded of
Brick and granite and glass and steel.
  In, and under, about, above,
Is there nothing the walls conceal?
Is there nothing the walls reveal?

Where the portion of labor's might?
  Work in quarry and toil in mine,
Stress and striving by day and night—
  Has it never a space or line?
Is there nothing to bring to light
All the stories the workmen write?

First the dream of a man—and then
The days and nights of a thousand men.

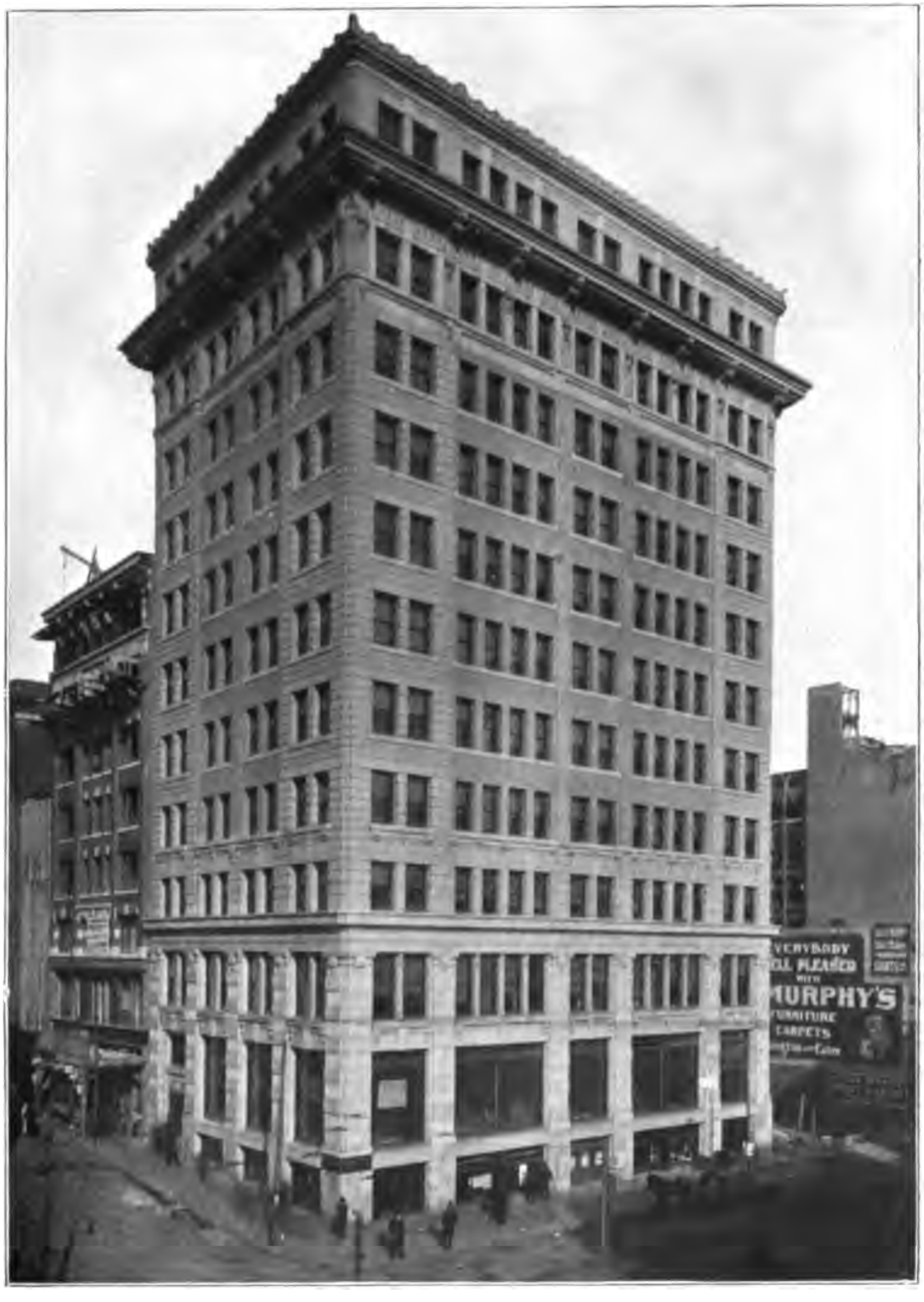
W. D. N.



THE RECONSTRUCTED CALVERT BUILDING, BALTIMORE.

Joseph Evans Sperry, Architect. The Geo. A. Fuller Company, Contractors.

One of the buildings in which all the hollow tile floors preserved the steel structure, except for the neglected column on the eighth floor, which "kinked" and caused most of the damage. The exterior stonework of this building was "restored" by coating the whole of it with a new composition said to be fire-resisting, all damaged parts having been filled out.



THE RECONSTRUCTED UNION TRUST BUILDING, BALTIMORE.

Parker & Thomas, Architects. Wells Bros. Company, Contractors.

The entire steel skeleton of this building was preserved. Nearly all the hollow tile floor arches remain as before the fire. The entire exterior walls have been reconstructed.

MORE ABOUT SPRINKLERS AND THE TROUBLES OF UNDERWRITERS

This magazine has from time to time severely criticised the use of sprinklers as a protection to buildings from fire, pretending to be a substitute for fireproof methods of construction. Special reference has been had to their use in mercantile buildings, storehouses and buildings not controlled by the severe rules of the New England Mutual Insurance companies. An endeavor has been made to get some evidence of their utility in actual fires, and in our January issue (pages 5 and 7) we presented some facts growing out of the experience in fires at Toronto and Minneapolis.

The question has now come up among the underwriters themselves and it seems that some of them, representing the stock companies, are not more in love with them than FIREPROOF MAGAZINE. It seems that the combination of stock companies known as the Western Union is considering the idea of getting and holding "Sprinklered business," but some of the companies (according to the *Chicago Record-Herald*) are not so sure about it after the almost total loss on the "sprinklered" plant of the American Cereal Company in Cedar Rapids. Some of them have had net losses of more than $20,000. The *Record-Herald* for March 9 gives the following account of the sprinklers in that fire, the total loss in which is said to have been about one million dollars:

> Dispatches from Cedar Rapids say that in the opinion of Fire Chief Cook and other firemen the automatic sprinklers in the cereal mills did very little if any work during the fire. They were placed in every part of the plant, and on the fire map the concern was given high credit for them. The first explosion destroyed one of the pressure tanks, and, in the opinion of the firemen, this practically crippled the whole system. Firemen who were in various parts of the plant report that they saw little if any sign of the sprinklers working. On previous occasions during small fires they have worked admirably.
>
> The loss is very similar to that on the Warner Sugar Refining Company in Waukegan last year, which was the heaviest for the year in Illinois, just as this is likely to be the heaviest for the year in Iowa. Each was started by an explosion which practically destroyed the efficiency of the sprinkler equipment. Since the Waukegan loss many companies have revised their sprinkler lines where an explosion hazard is involved.
>
> The Cedar Rapids plant was well equipped with the Grinnell system, and was supplied by a 16-inch main. The elevator group was destroyed, with two-thirds of the mill group. The fire leaped a seventy-five-foot space.

It will be noticed that the failure of the sprinklers is ascribed to explosions, and some might say that under such contingencies fireproof construction would not be a better remedy. But we have good evidence to the contrary. In fireproof buildings fire does not always follow explosions. We have before us the record of an explosion of gas on December 14, 1904, in a shop under Cranston's Waverly Hotel, Southampton Row, London. The girders and floors of this building were made of what is called "Granolithic Concrete." The force of the explosion was sufficient to raise the floors above where it occurred, but it did not destroy them. It caused other destruction but did not set fire to the building. The very weight of the floor was the salvation of the building.

A CHAT WITH BUSINESS MEN

BY F. W. FITZPATRICK.

(Concluded from March.)

INDIFFERENCE TO THE NECESSITY AND THE MEANS FOR PROTECTION AGAINST FIRE.

FOR my thirdly I must say that it is a matter of eternal surprise to me that intelligent people ever even think of building anything else but fireproof construction. Years ago, in our formative period, and even today in the new boom towns in Oklahoma and such new settlements, frame construction or even tents may be expected. Such shelter as is afforded is sufficient for a day or a brief time until more permanent structures are possible. But in old communities, and where lumber is indeed fast becoming a luxury and is recognized as a menace and a dangerously inflammable material it is absolutely incromprehensible why people keep on using it. It, like the silk hat, is simply a relic of custom, something we have inherited. Twenty years ago, when steel and tile were first used in construction, and when wood was cheap, the cost of fireproof construction was prohibitive except in special cases. People were told so then, and they still have that idea in mind, and I am afraid it is going to take some years and many more fires and other hard lessons to knock this idea out of their heads. They would like their buildings to be fireproof, well enough, especially after a big fire, but the wish dies a painful, though not a very lingering, death under the influence of the idea that it is going to cost them so much more money. A conflagration is but a chance after all, and the cost of fireproofing, they think, is a certainty, hence their deduction that it is not sound business to balance the certainty of cost against a purely problematic advantage—and then, too, there are the insurance companies ever ready to help the gentleman take a chance!

It is rather distressing that in the city of Baltimore, in Omaha, in Sioux City, in Toronto, in Minneapolis, the very places that have been most recently singed, the rebuilding is largely upon the old lines of tinder box construction. One reason is that people do not know any better and the next is that those who ought to keep them posted fail in their task. I have a report of one city, an enterprising city of the middle west, where 2,677 permits were taken out last year, involving an outlay of $6,600,000, and where there were but nine fireproof buildings erected during that period. Incidentally, the fire losses amounted to over $1,000,000. In another city $15,400,000 were put into 2,002 buildings, of which number 12 (!) were fireproof. In still another city, where 4,666 permits were taken out for buildings involving nearly $8,000,000, but 22 buildings, mostly small ones at that, were fireproof, and the fire loss was $1,500,000. I blame the newspapers very largely for the apathy of the people upon this subject. If a dog goes mad and bites a man or two the newspapers clamor for more ample police protection, the proper licensing of canines, if not their elimination from civic privileges, and a host of other cures and redressive measures without end.

After a terrible railroad wreck the same papers clamor for the abolition of grade crossings, the providing of more perfect block systems, etc., etc., and after a great fire they simply clamor for *greater water pressure*, a larger fire department with better apparatus, feeling about, as it were, for some sort of palliative, or at best a little salve to put upon the sore, rather than striking at the root of the evil and eradicating it by advocating a preventative. We have been able to stamp out, thoroughly stamp out, smallpox, yellow fever, and a lot of those things which seemed a few years ago to be the necessary accompaniment of life in certain districts, by using drastic methods, not to cure the patients so afflicted, but to prevent people from contracting the loathed disease, wiping out the cause of it. If the newspapers of the country would set themselves as energetically to this task, advocating fireproof construction instead of perfected fire-fighting appliances, and insisting upon the proper legislative enactments, it would be but a question of months when popular opinion so directed and educated would place insurmountable obstacles in the way of the shysters and speculative builders of firetraps, and there would be evolved some method of eliminating the danger which lies in existing buildings of antiquated construction.

WHAT FIREPROOFING MEANS.

And this is my lastly: If you have been awakened to the proper realization of conditions as they are and as they are bound to be unless something drastic is done to correct them, and you appreciate that it is to your own interests and pecuniary advantage to have your next building well built and fireproof, the question naturally arises with you "What is fireproof?" My audience being business men, and having much to attend to, I am not going to take up their time with any lengthy treatise on this subject from an abstrusely technical standpoint, but I will briefly give you a few points to think upon. One must differentiate and place things in their proper categories. The term fireproof has been grossly misapplied to many things which are not so in any sense of the term, as we have stated before, and then again, in perfect honesty, it has been made to encompass many other things which in certain combinations may deserve the term, but in the abstract have no right to that term. As far as construction goes you must remember that many materials, though incombustible, are very seriously *damaged* by fire. Granite, all kinds of stones, marbles, slate, concrete, glass, iron, steel, while they will not burn nor communicate fire are, when subjected to severe heat, not only ruined, but contribute gravely to the danger of collapse and the destruction of life, sometimes to even a greater extent than does wood, which *is* inflammable. If your structure is built entirely of these non-inflammable, but nevertheless destructible materials, and is surrounded by similarly constructed buildings, and if there is no, or at least very little inflammable material in the way of furniture or goods within those buildings, then the possibility of damage by fire to those, I say, destructible materials, is very remote indeed. But if your building, which you want to keep immune from damage by fire, is located in a district composed of highly inflammable buildings containing great quantities of combustible materials, and your building is also to contain considerable quantities of similarly burnable goods, then the risk you are exposed to is great, ever-present, and imminent, and to secure immunity you must use none of the materials that in themselves are damageable by fire, as before enumerated, or, if you use them, then they must be protected, too. As a matter of fact modern science, which after all but supports the discoveries of æons ago in many things, proves to us that as far as construction goes the most fire-resisting materials are those which, in their process of manufacture, have passed through a greater heat than they can ever be subjected to, even in a great conflagration.

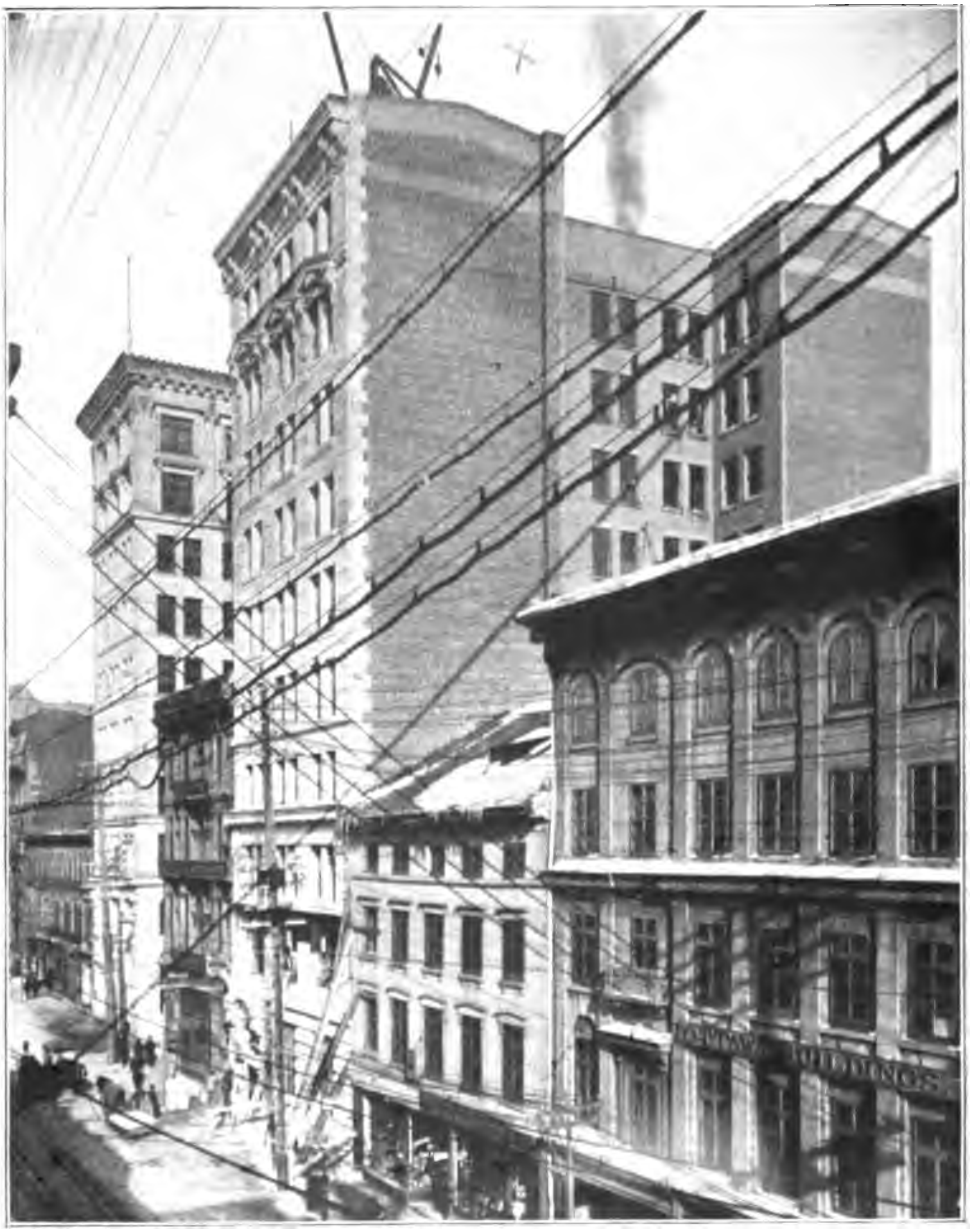
Brick is one of the most thoroughly fireproof materials we know of. It has passed through fire in its manufacture and will withstand, without damage, intense heat and flame. That other clay product, fireproofing-tile, is subjected to still greater heat in the kilns in which it is baked, and if properly made no fire that has ever raged can destroy its efficiency. Why, in Baltimore, in that most severe test to which the work of man has ever been subjected, and where much of this fireproofing tile work had been done years ago, when the science was in the infant stage of its development and had been erected by incompetent hands, and some of it really hardly merited the term fireproofing, it protected the great steel frames of the skyscrapers so that in most cases but one or two per cent of damage was sustained by that framing, and where the tile itself, poor as much of it was, was damaged but seven or eight per cent, where all else was swept out of existence! Incidentally it may not be out of place to here remark that many advocates of concrete construction found much fault with the Baltimore skyscrapers which were protected with hollow tile, and which withstood the test, and to add that those same skyscrapers are the first of the buildings in the burned district to be tenanted, that the one new skyscraper which has been built is also fireproofed with tile, and that the very much advertised concrete building, one of the two or three insignificant examples of that construction which were in Baltimore, has entirely disappeared.

But let us leave concrete alone and get back to the consideration of what *is* really fireproof. Unless your proposed building is located in the ideal surroundings we have mentioned—and I am sorry to say they do not exist in this country—it is not wise to use granite or stone or marble on the exterior. If you do you lay yourself open to having much of it to do over again some day or another. Brick and terra cotta trimmings will stand you in much better stead. The structural parts, all things considered, had best be of steel, thoroughly coated and rendered invulnerable to atmospheric influences and resultant oxidation with Portland cement, and lots of it, then encased in well-burned, well-laid, porous, fireproofing tile. Solid porous tile is the best. Or the supporting members may be of concrete, or of stone, or of a combination of concrete and steel, *but* they too should be protected with fireproofing tile. The floor construction should be of narrow spans of fireproof tile arches between steel beams. These beams, as well as everything else metal about the structure, should be made rustproof with cement and amply protected by proper forms of fireproofing tile. The partitions should preferably be of fireproof tile, though there again any other form which is incombustible may be used with proper discretion, though there is always the possibility of having much repair to do in case of even an incipient fire, so why not use the perfect thing in the first place, and why dally with substitutes? Wood floors are to be avoided. Use some form of cement or tile. Where the windows are exposed to fire in adjacent buildings, or on narrow streets, use metal sash and wired glass. You may have to repair even these after a hot fire in the neighborhood, but they will have saved the interior of your building from certain damage. Cut off your stairs and elevators with fireproof partitions forming invulnerable shafts, closed at every story with fireproof automatically working doors. Opening a door may be a little troublesome, but it is far better to do that every time you go from one story to another than it is to risk the spread of fire up through your building, and even if fire didn't so spread, if once started in your goods the smoke and gases rising to other stories might create a panic among your tenants. Every story absolutely isolated by this cutting off of openings in the floor means, too, that fire started in amongst furniture or goods can be quickly and easily controlled. Pretty and stylish as heavy wood wainscoting, wood ceilings and other elaborate decorations may be, don't use them. If from a necessity or economy you must have wooden doors and trimmings, reduce them to the veriest minimum. Make your decorations plastic and trust to the decorator's art in painting and relief work for decorative effect. Cut out the wood. See that you have plenty of water, and always handy, and that there are sufficient appliances always within reach to fight fire wherever that monster may show its head. If you have many employes, or if yours is an institution where many people daily congregate, inaugurate and keep up some sort of a system of fire drill so that those in charge may know what to do in case there is a little fire. Use good sense.

As surely as fate, the moment it is noised about that you propose building you will be beseiged by "hordes of hungry jackals," or if that is too poetic, let us call the gentlemen fakirs, and others having all sorts of "good things to sell." Some will preach to you about the great virtues of so-called "slow-burning" construction, where you put in just as much wood as your building can conveniently hold, and with the hope that if there is a fire it will only burn a little off the surface! Others will descant to you upon the wonderful virtues of certain wire lath, while 30 other wise gentlemen will wine you and dine you, the while descanting most fluently and attractively upon the wonderful tests made by this or that long-haired savant, who has definitely demonstrated that each one of those 30 gentlemen represents the only and original perfect system of ferro—or fairy—concrete construction, that, without any visible means of support, is good to withstand endless tons of superimposed weight on indefinitely long spans of delicately but geometrically perfect interlacings of wire, ashes, cement and water. But don't waste your time listening to them.

The advice contained in most family medical books generally consists of an abjuration to do this and that and the other thing in case of an accident, but also winds up with the sound admonition to send for a doctor. So in building. You may formulate your ideas along sensible lines, but finally entrust your case to an architect whom you know is worthy of your confidence, one who knows his business thoroughly and appreciates conditions as they are, and has some idea as to how they may be remedied. Tell him you want a fireproof building that is *fireproof* and he, not being a charlatan, will see that you get what is right, what is the most durable, the most invulnerable, what costs the least in the long run, what will bring you the best returns for your investment, and what will give you the most satisfaction, in feeling that you not only have safeguarded and furthered your own interests, but those of the community in which you live and those of the country of which you are a loyal citizen.

Again I say, call in an architect.



SOVEREIGN BANK, MONTREAL.
H. C. Stone, Architect; C. Thackray, Contractor.
The illustration of this building in FIREPROOF MAGAZINE for March showed the steel skeleton construction. The above shows the bank building nearing completion.

National Fire Proofing Company

Testing Station, Chicago.

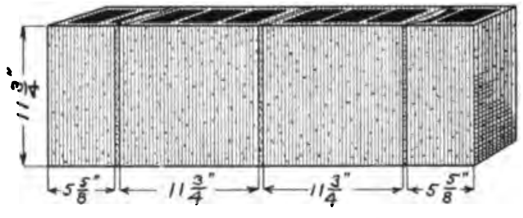
NUMBER OF ARTICLE	WHEN MADE	WHEN TESTED	FIRST SERIOUS CRACK	MAXIMUM PRESSURE	CUBIC INCHES IN WALL	STRENGTH PER SQUARE INCH
442	8/16-04	12/16-04	60 TONS	60 TONS	10278.87	1600.0 *

TEST

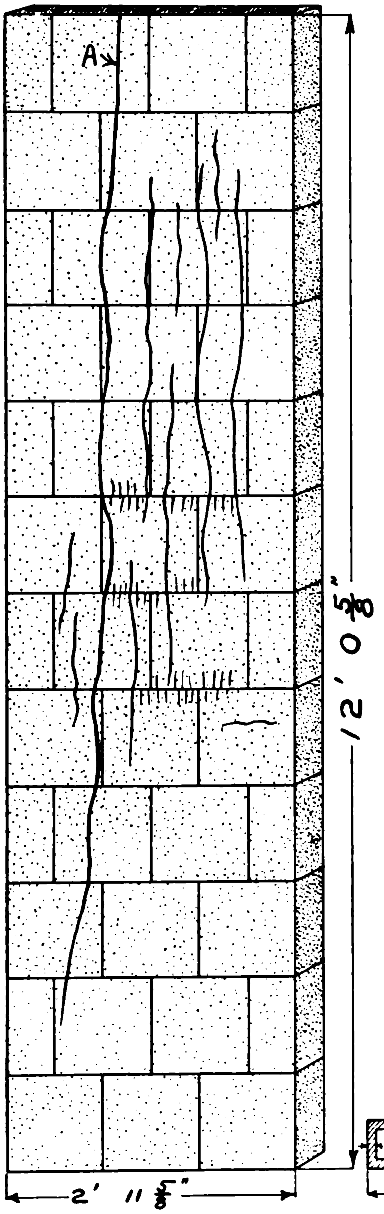
AT 30 TONS PRESSURE VERY SLIGHT SOUNDS WERE GIVEN OFF, POSSIBLY DUE TO COMPRESSION OF MORTAR BEDS. SOUNDS CONTINUED UNTIL 48 TONS WAS REACHED WHEN THE SOUNDS BECAME A TRIFLE SHARPER AND CONTNUED SLIGHT AND SHARP UP TO THE MAXIMUM PRESSURE OF 60 TONS. WALL GAVE OFF NO SERIOUS SOUND TO INDICATE GIVING WAY OF ANY SINGLE WEB. WALL FAILED BY A GENERAL GRUSH OF ALL WEBS. THE PRINCIPAL FAILURE OCCURED. ALONG LINE "A".

CONSTRUCTION

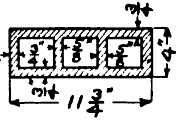
WALL BUILT OF LIGHT COLORED, HARD BURNED, PIONEER TILE. TILE WITH SIDES AND ENDS OUT OF SQUARE WERE REJECTED, NO OTHER DISCRIMINATION, TILE TAKEN AT RANDOM FROM THEIR PILE IN THE YARD. TILE SET IN GOOD BRICK MORTAR TO WHICH A LITTLE CEMENT HAD BEEN ADDED. WALL HAD THREE SIDES PERFECTLY PLUMB.



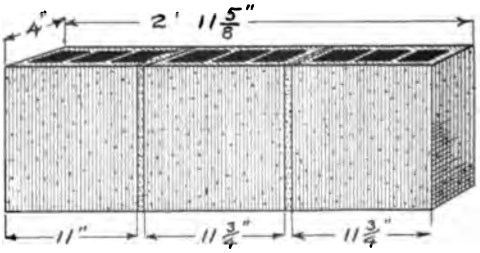
Detail of 2nd, 4th, Etc. Courses.



Partition Tested.



Section



Detail of 1st, 3rd, Etc. Courses

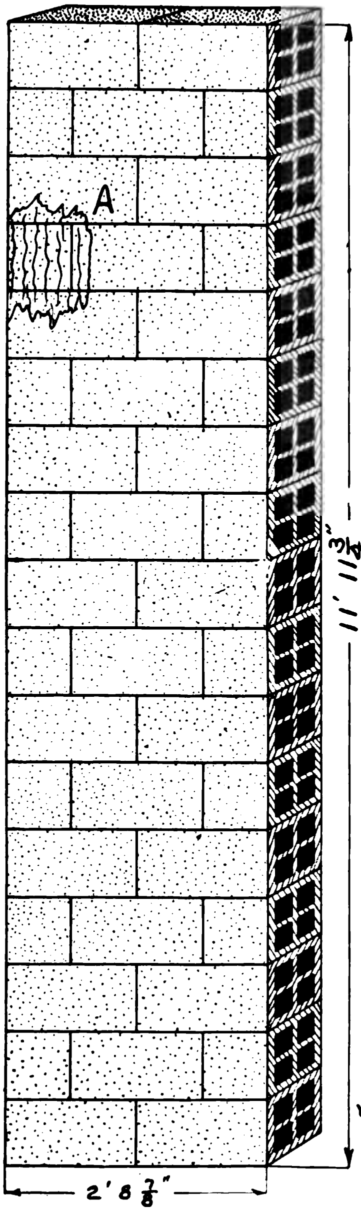
Test of 4" Hollow, Hard-Burned Tile Partition.

W H Roney C.E.

TEST SHEET NO. 5.

National Fire Proofing Company,
Testing Station, Chicago.

NUMBER OF ARTICLE	WHEN MADE	WHEN TESTED	FIRST SERIOUS CRACK	MAXIMUM PRESSURE	AREA OF TILE IN COMPRESSION	STRENGTH PER SQUARE INCH.
432	8/11-04	11/18-04	43.5 TONS	43.5 TONS	78.08 □"	1114.2 *



Partition Tested.

TEST

THE MOST NOTICEABLE SOUNDS AND CRUSHING OCCURED WHEN 32, 33½, AND 35 TONS WERE APPLIED. THERE WERE VERY SLIGHT SOUNDS AT 10, 20, AND 25 TONS.

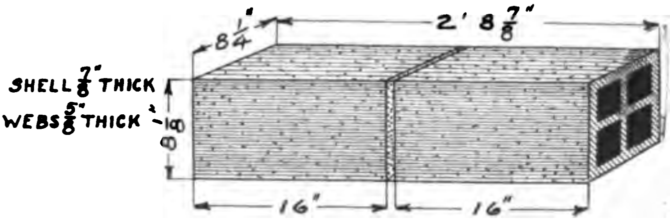
THE WALL FAILED DIRECTLY AFTER A VISIBLE INDICATION AT "A".

THE HORIZONTAL WEBS AND SHELLS CRUSHED.

TONS	COMPRESSION
5	—
10	3/64"
5	RECOVERS WITHIN 1/64"
15	1/16"
5	RECOVERS WITHIN 3/64
20	3/32"
5	RECOVERS WITHIN 1/16
25	1/8"
5	RECOVERS WITHIN 1/16
30	1/8"
5	RECOVERS WITHIN 1/16

CONSTRUCTION.

WALL BUILT OF LIGHT COLORED, MEDIUM-BURNED, HOLLOW TILE, LAID UP IN GOOD BRICK MORTAR TO WHICH A LITTLE CEMENT HAD BEEN ADDED. TILE WITH SIDES SQUARE, TAKEN AT RANDOM FROM THEIR PILE IN THE YARD, WERE USED. WALL BUILT WITH THREE SURFACES PLUMB. THE HALF LENGTH TILE WERE BROKEN FROM 16" LENGTH PIECES, THE SHELLS BREAKING SMOOTHLY, THE WEBS BREAKING BADLY.

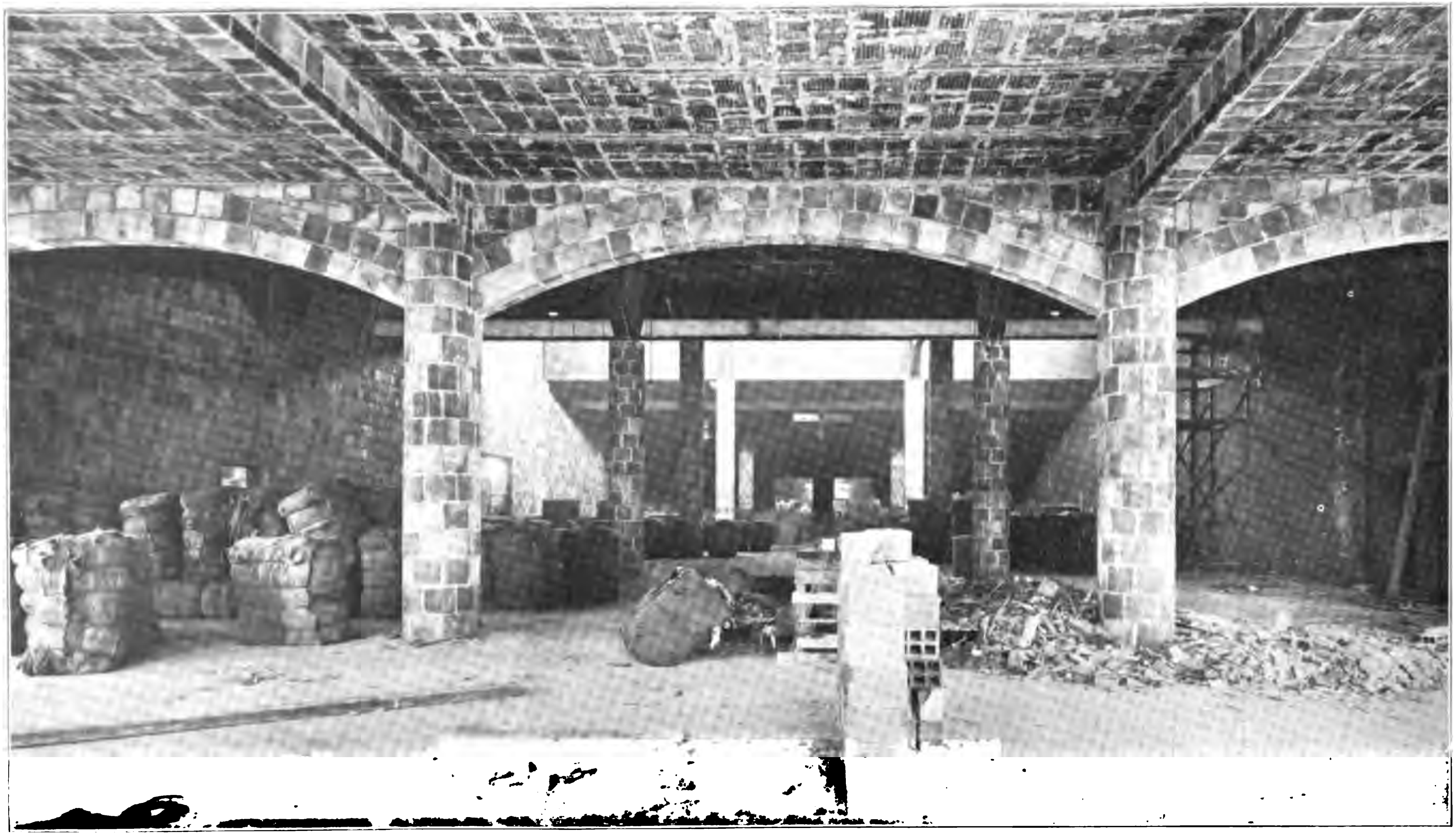


Detail of One Course.

Test of 8" Hard, Side-Pressure Tile Partition.

TEST SHEET NO. 6.

W H Roney C.E.

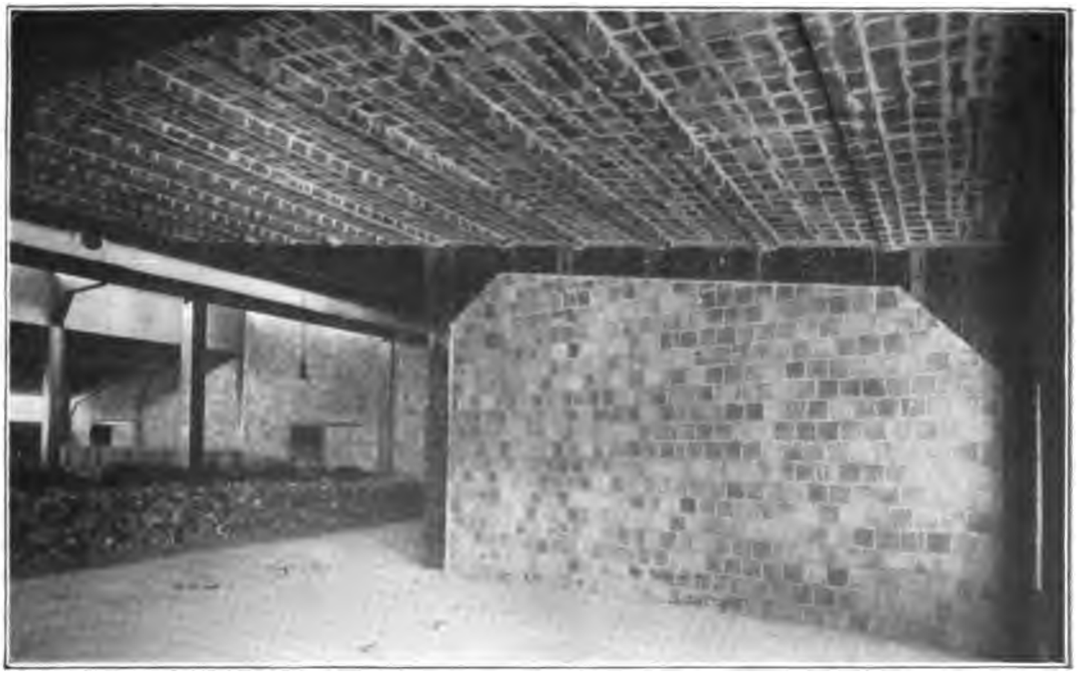


HAMBURG-AMERICAN PIER BUILDING, HOBOKEN, N. J.
Details of Arch Construction in Passengers' Waiting Room.

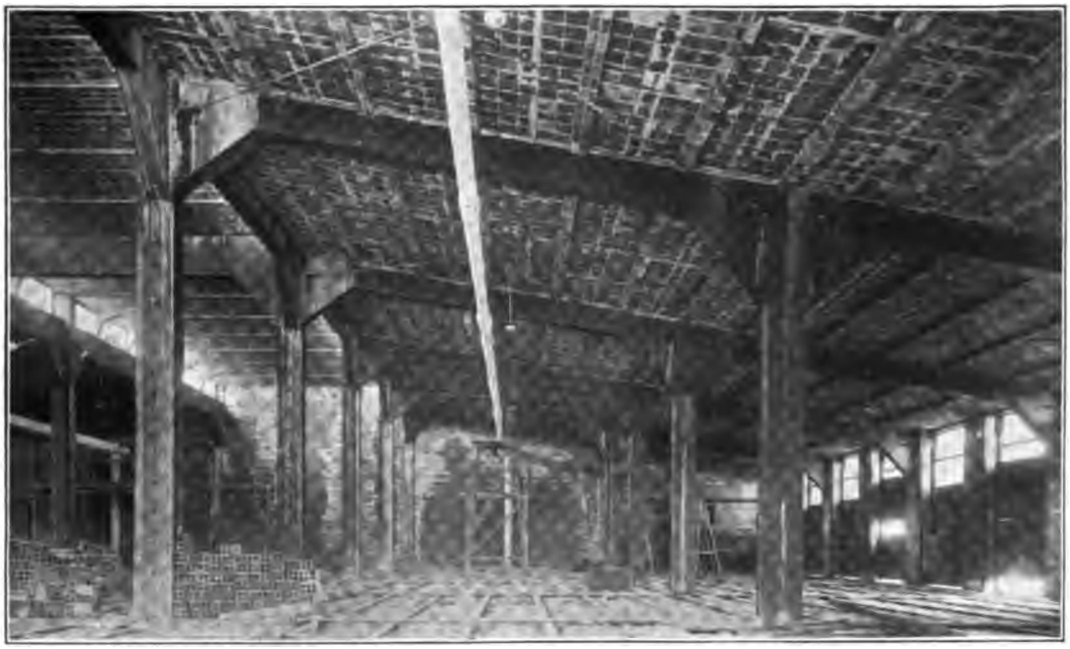
FIREPROOFING OF THE HAMBURG-AMERICAN PIER AT HOBOKEN, N. J.

IN our last issue we took occasion to criticise the want of consideration of the most elementary principles of fireproof construction involved in the reconstruction of the North German Lloyd Company's docks and sheds at Hoboken, N. J., in which I-beams are used for floor construction without fire protection to the lower flanges. We are able to present on this and the adjoining pages, in striking contrast with this error, three illustrations from photographs of the new pier buildings of the Hamburg-American line now being finished at Hoboken. In these all the I-beams are covered on the bottom flanges, and the girders and columns are encased in porous terra cotta. The greatest pains have been taken to secure thoroughly protected steel construction. In one of the pictures this will be seen completed. In the others the steel columns and girders are visible, but the photographs were taken before this part of the work had been done.

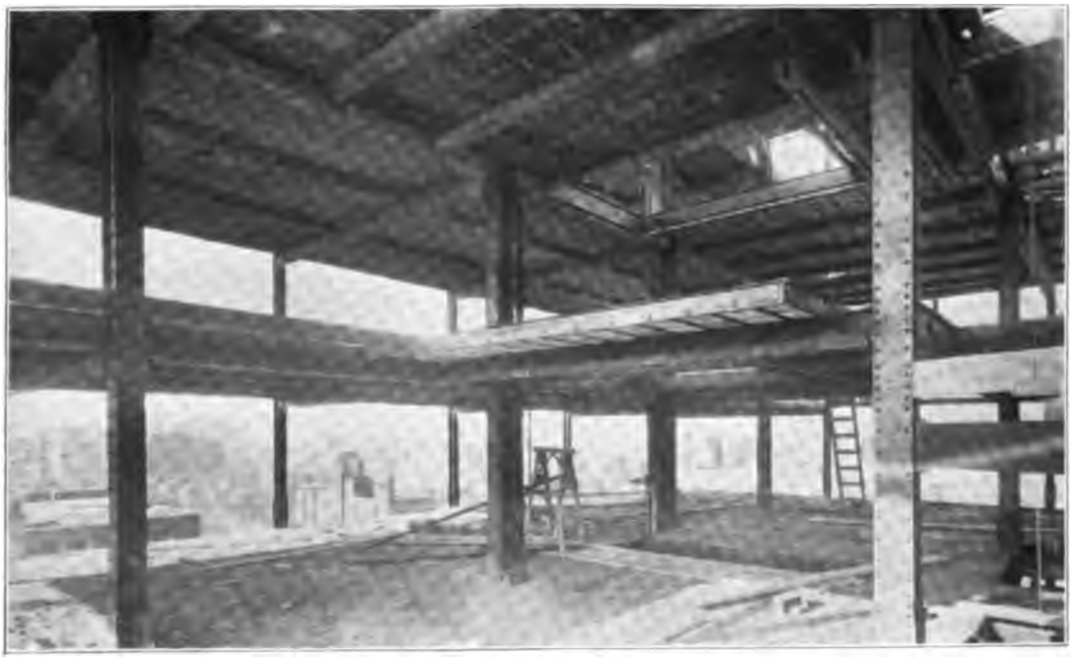
The roof construction is with 8-inch flat hollow tile arches. The floor construction is with 6-inch segment arches. The partitions are built with 8-inch tile and some of them are 36 feet high. In covering the floor beams care has been taken that at least 2 inches of porous terra cotta shall extend beyond the most projecting part of the beams. Eighty thousand superficial feet of floor arches and an equal amount of roof arches are used. Here we see complete fireproofing in a new field.



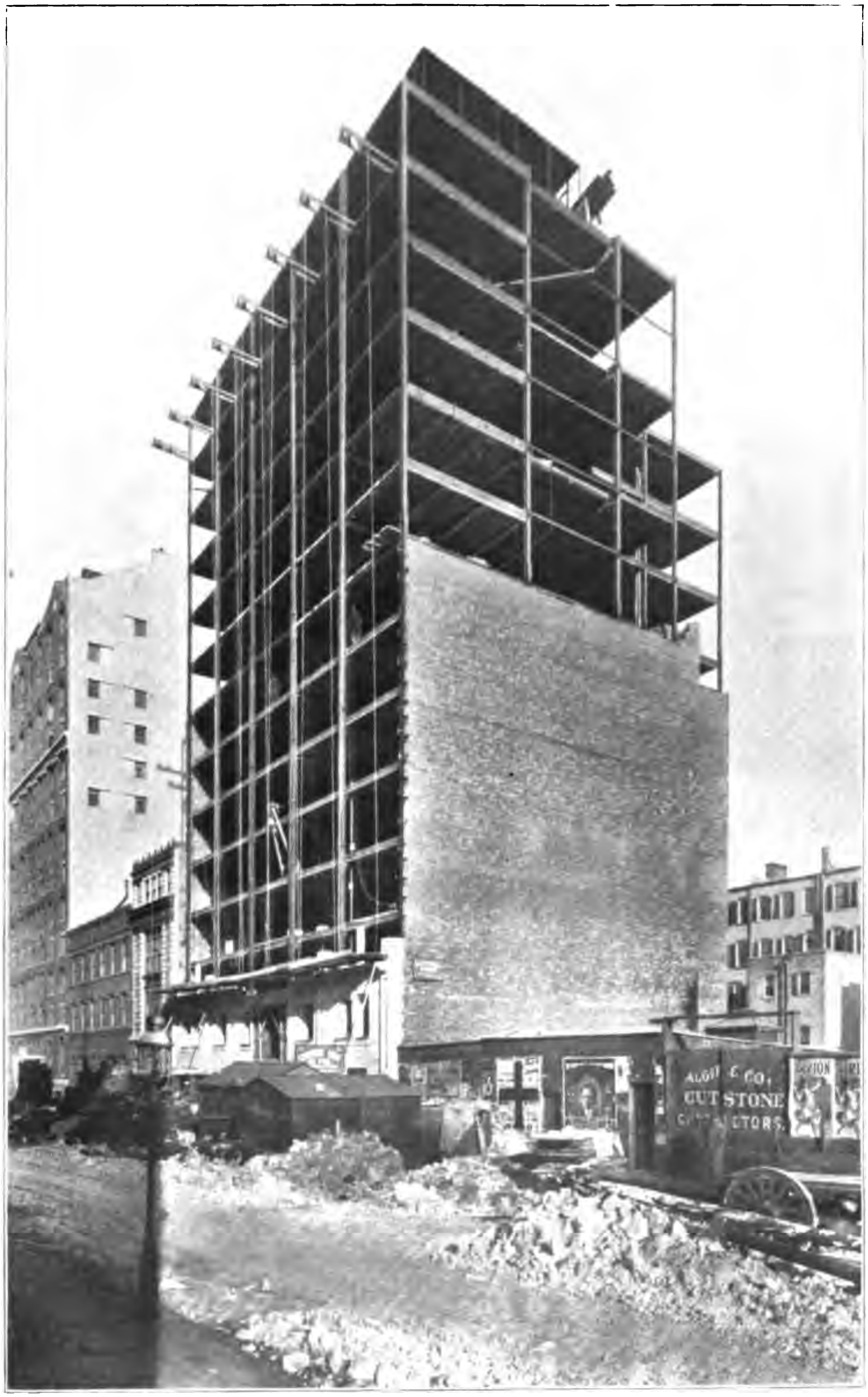
HAMBURG-AMERICAN PIER BUILDING, HOBOKEN, N. J.
Showing Roof Arches and Partitions.



HAMBURG-AMERICAN PIER BUILDING, HOBOKEN, N. J.
Another View in the Second Story.



CENTRAL PARK STUDIO BUILDING, NEW YORK CITY.
Showing Steel Construction and Hollow Tile Fireproofing Partly Completed.



STEEL SKELETON OF CENTRAL PARK STUDIO BUILDING, NEW YORK CITY.

To be completely fireproofed with hollow porous tile by the National Fireproofing Company, New York, who are also fireproofing the Hamburg-American Pier House. The floor arches are in place in the above illustration. Note the hanging scaffolding for setting front stonework.

THE BOYS' HIGH SCHOOL FIRE, PHILADELPHIA

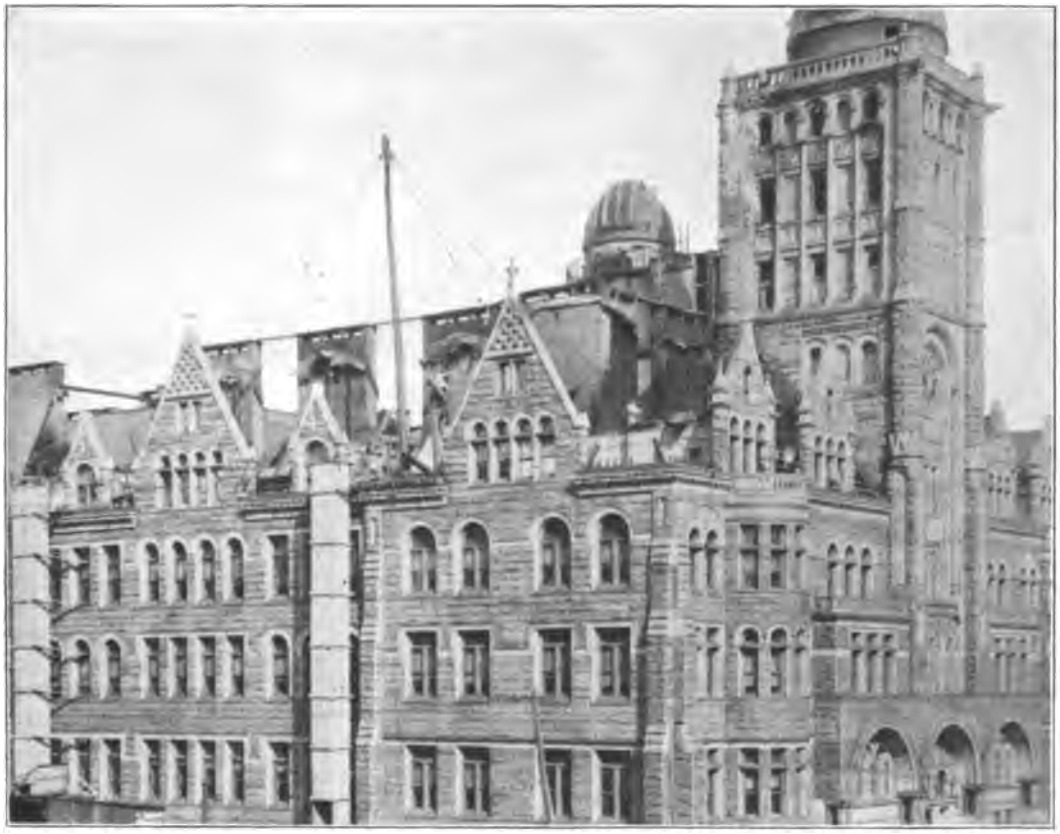
BY EDWIN F. BERTOLETT, C. E.

The plain every day precepts, felt to be impressively exemplified in their violation, as one beholds the wreck, ruin and loss, much of it irreparable and inestimable, which fire has worked upon the Boys' High School on North Broad street, would set at nought more than one course of lectures on ethical prudence and would seem to call for serious review of the policies of construction in connection with schoolhouse building, for the whole main building, 170 feet by 220 feet, five stories and basement high, with a fine astronomical observation tower costing in all well toward a million dollars and containing a complete outfit of instruments, records, library and a vast accumulation of unpublished data, besides the usual school equipment and paraphernalia, now lies in greater or less condition of devastation, all because of the thoughtless, if not the sordid policy which decreed that an otherwise excellent building should be topped out with a highly inflammable roof, attic story and a wood lined, ceiled and floored observatory tower. One hundred and twenty-five thousand dollars may, as is estimated, replace the roof and tower, refurnish and expunge the excessive saturation to a degree somewhat consistent with former conditions, but what of the destroyed records, scientific data and files of more than historic interest that formed an unappraisable proportion of the school's equipment and historical attainments? And what can be said in extenuation of the inexcusably inconsistent crowding out of the builders' work in finishing the structure?

The work seems to have been literally "half done;" for the substantial granite-faced brick walls of the exterior have been continued to the very parapet of the observatory tower and the splendidly executed interior brick corridors and partition walls have been maintained in ample proportions to the very roof; the floor systems from the first to and including the fourth have been well laid on protected steel beams with hollow clay tile fireproofing without stint of materials; the stairways are entirely of iron, and an abundance of outside balcony and brick-enclosed fire escapes are in place, and had "some confusion of tongues" stricken the builders and authorities at the termination of their good work on the fourth story, Philadelphia would not to-day be bemoaning the loss of her high school's invaluable records, astronomical instruments, library and the thousand and one priceless accessories of the scientific department, which seems to have been located in the most flimsily constructed part of the school building, and to which Professor Snyder so faithfully and effectually devoted his unselfish life.

But unfortunately no judgment prevented the carrying out of the project of crowning this piece of rational, four-story construction with that "abomination of desolation," a wooden roof and attic story, opening into the granite-faced, brick observatory tower, also wood floored, roofed and lined and four stories higher than the said wooden attic.

Most thoroughly did this nefarious piece of parsimonious construction maintain its reputation, for the fire, once started near

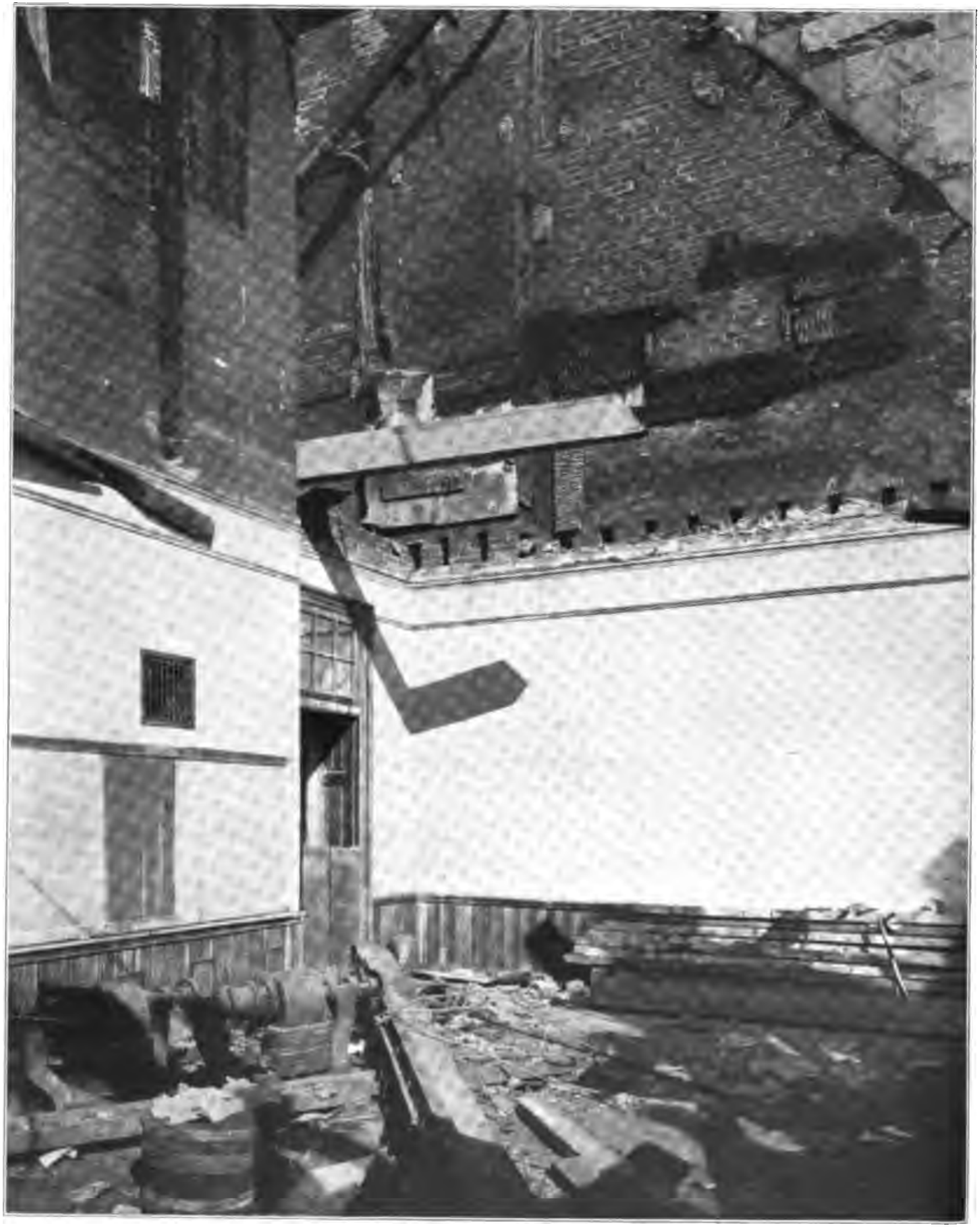


BOYS' HIGH SCHOOL BUILDING, PHILADELPHIA, PA.
Showing the destroyed fourth story and ruined observatory tower. Burned March 9, 1905.

the main roof line, spread both ways and into the tower besides, destroying all within its immediate limit and not only jeopardizing the entire building, but exacting the terrible price of destruction by water of everything porous in the stories below to and including the basement; for while the floors below have proven themselves entirely fireproof, they are not waterproof and the leakage through floors and ceilings and floods from stairs and elevator shafts, the consequent destruction of books, furnishings and equipment has been serious.

The fireproof construction actually suffers more by the sort of mongrel or combination methods that have been employed in construction of this building than it gains, for the cause of rational building or fireproofing is well brought out in the evident shock and disgust of the public in discovering that what had gained the reputation of being fireproof was actually being devoured by flames, and it will be just as well when the day shall dawn in which the fireproofing manufacturers will strongly resist the temptations to supply their product for introduction in connection with combustible roofs, floors or walls, for materials, like men, are apt to be misjudged by their bad associations.

There is, however, in this instance compensation and consolation that so large a part of the building had been rendered fireproof, notwithstanding the universal regret that the roof, attic story (which was used for class and lecture rooms), and the observatory and scientific rooms of the tower had not been so constructed of fireproof materials, for the hollow tile floors have undisputably saved the entire building below the fourth floor from entire destruction, and the silent eloquence with which these floors

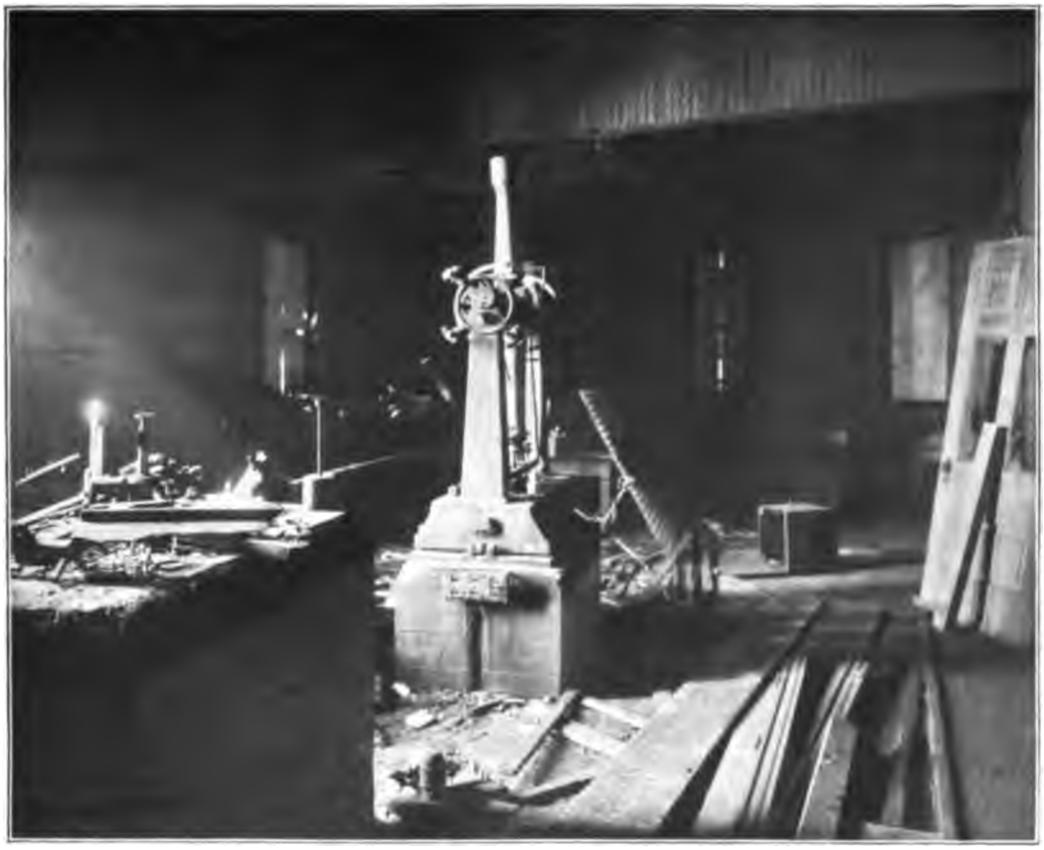


BOYS' HIGH SCHOOL BUILDING, PHILADELPHIA, PA.

Showing the location of burned-out floor system, of wood, the former wood roof, the solid brick wall and the fourth floor system of iron beams and terra cotta tile intact, upon which heavy derricks and hoisting machinery is being set up.

bear the terrible inundation required to subdue the conflagration which raged above it is most appealing in the practical demonstration of serviceability of incombustible floor system, and is a complete indictment of those guilty minds who suffered the imposition of the combustible burden above it.

The lessons to be gleaned from the



BOYS' HIGH SCHOOL BUILDING, PHILADELPHIA, PA.
Showing one of the astronomical instruments and file room, with its excessive wood trimming and lining, charred woodwork and ruined instruments.

burned observatory tower and roof story are not new; they have been impressed at high cost many times before, but we are slow to profit by them; and it will be interesting to note what the effect will be upon those having the rebuilding work in charge. Will they be again reconciled, out of consideration for a portion of the roof still remaining, to rebuild with wood, lath, plaster and stamped sheet metal, or will they take warning and be prompted by what has been accomplished by the sturdy clay tile floor systems which have so triumphantly withstood the fierce onslaught of flames and floods, with nothing more serious than superficial scars? Every facility is here offered for the most solid and durable work in the new floors and ceilings. The walls, both internal and external, seem ample and inviting for reception of continuation of the beam and tile construction of the floors below, and it is hardly conceiveable that the authorities will again permit the massing of so much wood work in floors, furring, wainscot, ceilings, stairway and elevator shaft, window casing and other features that the house carpenter so thoroughly revels in. These seem to have been indulged in to excess when the abandonment of the fireproof systems was once under full license, and no thought was given further to the simple, durable treatment of a well plastered surface on the hollow tile furring, arching, etc., without the flimsily perforated and stamp metal accompaniments, which are now so very prominent in the general dilapidation. The possibilities of this form of simple plaster finish, when done in such materials for the purpose, can be made to lend an infinite charm to the appearance, sense and dignity to the construction and safety and durability to the building and its contents, and it is to be hoped some such form of finish will be adopted in the reconstruction.

There has rarely been, in the same building, so much that is profoundly rational brought into marked contrast and rivalry with primitive, frame cottage construction, and in which the superlative qualities of the former stand in marked opposition to the negative conditions of the latter; hence the grasping of the moral of the disaster is made measurably easy and unusually direct, and while the collateral inquiries as to the origin of the fire, which is supposed to have been from an electric lighting main, in the timber work either from a cross, bad insulation or deficiency in installing, and the personal responsibility of those in custody in the building are occupying the attention of those most directly interested, the salient truth is continually uppermost and will not down. That is, that having built so large a proportion of the structure well, it should, without exception, have been completed in the same manner, and no part of the building should have been left a possible prey to a conflagration or even a heated wire. It is fortunate that among the many school buildings of the city accident should decree that this fire should occur in about the only building that is in any way built to resist destruction. Though thousands of dollars are appropriated every year for new buildings, but little thought seems to be given to their possible loss by fire.

Need the appeal to school controllers be made more direct than has been made by the above facts? Had the school board in the building of the Boys' High School, Philadelphia, but remembered the simple homely maxim that "what is worth doing is worth doing well," they would now be spared the regrets consequent upon such losses and inconveniences.

A PROPOSED FIREPROOF SCHOOL BUILDING, THOUGH A SMALL ONE

After several days' consideration and a thorough inspection of the plans for the new school building to be located at Nineteenth and Mary streets, Covington, submitted by Architects Schofield & Walker, the building committee of the Board of Education has decided to recommend the erection of an absolutely fireproof building. The plans, as revised by the committee, provide for a three-story brick and concrete building.

The outer walls will be brick, but all interior work, including interior walls, partitions and ceilings, is to be of cement, with combination floors in the classrooms and tile floors in the halls. With the exception of the mixture of hardwood in the classroom floors, there will be no wood in the building, thus reducing the danger of fire to the minimum.

A fireproof building will cost about $6,600, or $600 more than the estimate in the plans submitted by the architects. Architects Schofield & Walker will be engaged as the architects, but the selection of a superintendent to supervise the construction of the building has not been made.—Cincinnati Inquirer.

COMBUSTIBLE FINISH BARRED FROM A NEW HOSPITAL

A new Methodist Home for the Aged is to be erected at College Hill, Cincinnati. It appears that, for the second time in its history, it was destroyed by fire in January. It is not only to be fireproof, but, according to a report in the Cincinnati Star, President Weakley of the Home said: "We are not going to allow one piece of wood to go into the construction of the new building for the home, if that is possible. We want to have Venetian tile floors and to have every partition wall fireproof."

FIREPROOF PAINTS AND THEIR USE

BY GEORGE E. WALSH.

In the manufacture of modern paints the introduction of mineral elements that possess rare fireproofing qualities has in some instances secured excellent results. The secret processes of the different manufacturers make it impossible for builders and architects to ascertain positively, except by trial, the relative value of the fireproofing qualities claimed. In some recent experiments it has been demonstrated in England that titanic acid, or the oxide of titanium, has remarkable fireproofing qualities, and when introduced in paints it tends to lessen their inflammability considerably. At Nottingham, England, titanic acid was used as the chief material for fireproofing cloth. At a recent meeting of the society of dyers at Manchester evidence was given to show that ordinary cloth treated with a titanic acid bath was rendered practically fireproof under ordinary heat. When a match was applied the fire smouldered slightly and refused to burst into flames. Further experiments showed that dyeing, boiling and washing had no definite effect upon the fireproof condition of the fabric. The acid had become an integral part of the fabric, although under repeated washings its effect might gradually disappear. The introduction of titanic acid in fireproof paints requires chemical changes which call for considerable experiment and tests, but as a component part of any paint the oxide of titanium should prove of desirable value.

In protecting wood or other absorbent material with fireproof or partially fireproof paint, the essential thing is to make a liquid application which will enter into the pores of the wood a considerable distance from the surface. In fireproofing or preserving wood from decay from the elements, the chemical solution employed is injected into the wood until it fills all the air spaces and in some instances takes the place of the wood itself. When oil preservatives are thus used for telephone poles the saturation must be made complete or else the life of the pole placed underground will not be materially prolonged. The deeper that this penetration is made, the more perfect is the protection. The same holds true of fireproof paint. Unless the metallic substances which form the fire-resisting body of the paint can be injected into the pores of the wood some distance, its highest effect will not be obtained. A thin liquid of fireproof material sprayed against the wood surface by a force pump thus proves of particular advantage. The liquid is absorbed by the wood until a layer of it is formed over the whole surface.

The outside coat of fireproof paint is of heavier body than the first, and it should form a perfect layer of metallic substance which can offer the highest possible resistance to heat. No paint is absolutely fireproof, or ever will be, but the measure of protection obtained consists in the amount of heat-resisting qualities that lie in the surface coating. The non-conducting quality of this coat protects the wood from instant ignition and thus insures an amount of security against fire loss that is of great value.

The use of fireproof paint that will thus retard rather than spread the flames for interior ornamental purposes tends to protect our homes and public buildings in a remarkable way. Too often the structure of a building is fireproof, but inside of the shell there is lacking nearly all those safeguards against fire which science has erected in modern times for our protection. The question of confining a fire to one or more rooms is one of the most important to-day. Like the different compartments of the ship, the different floors and suites of rooms should be shut off in an emergency from all other parts of the place. A fire could thus be smothered, or at least confined to a small place. It is in the use of fireproof paint for the walls, ceilings and woodwork that this can be partially obtained. With a practically dead wall of non-inflammable material confronting it, a sudden fire in the home could be much easier managed than where oil paints would feed it and fan it on to greater fury. Fireproof paint employed in this way in the homes would add a measure of security to our lives and property not thoroughly appreciated to-day.

Fireproof paint of this character has a distinct field in buildings where steel, bricks, stone and tiling are the chief materials of construction. Damp-resisting and anti-rust paints are frequently highly inflammable in their composition. A moderate amount of external heat will cause them to peel off and to catch fire. The result is that a fire may easily be spread on the inside of partitions by the paint itself. The paint used for protecting the iron structural part of the building may thus carry a flame up from one story to another, and, if nothing more injurious has been done, it will peel off the protective coating from the steel girders and pillars.

A fireproof paint would serve the purpose of preventing the spread of the fire and at the same time protect the steel and iron framework from injury. Where slight fires have been started in steel structures it has been found necessary in rebuilding to strip off the walls and floors to get at the steel girders to repaint them.

In the use of dampproof paint for walls and floors of buildings the inflammable nature of the material is of importance. Its consideration should be just as important as its dampproof qualities. Primarily the paint is made for a particular purpose, but until all paints which enter into modern buildings are rendered partially fireproof their highest achievement cannot be reached. The danger from electrical wiring through short-circuiting and destruction of insulation is always with us, and when we add to this the proximity of inflammable paint the menace becomes of considerable moment. Paint is often used freely around panel switchboards and entrances for wires for electric lighting, and the danger may in some cases prove a distinct menace. Yet a perfect non-conductor of electricity in the form of paint is used in the electrical trade, and this, when used, insures safety from short-circuiting.

Chemists and paint manufacturers find it difficult to secure the highest tones and colors in their products in combination with fireproofing metallic compounds. The problem appears to be how much it is wise to sacrifice beauty of finish for additional protection. In the construction of modern fireproof buildings safety is the first consideration, and where art and finish conflict with the question of security the former must give way. It is apparent that paint manufacturers must produce fire-resisting paints of different grades, which will permit of wide use and application for different buildings. The virtues of these paints must appeal more and more to architects who are seeking to combine beauty with safety. Whatever the past of the question may have been, it is quite apparent that the demand for fire-resisting paints will increase as the additional security obtained by their use is more fully appreciated by the public. They are in line with modern developments in building operations, and their usefulness grows as improved methods for building and protecting our homes and offices are adopted by architects and engineers.

NOTE BY THE EDITOR.—Our contributor has said about all that can be said in favor of fireproof paints and his comments on the limitation of their use are valuable. It is only because they may be of some service in retarding incipient fires that we recognize their value, but that is no reason why they should be depended upon as in any sense fireproof.

FIRE FIGHTING, FIREPROOFING AND ARCHITECTURE IN RUSSIA

(*From our St. Petersburg Correspondent.*)

St. Petersburg, Feb. 15, 1905.

It is barely possible after the terrible events of recent days for one to compose himself sufficiently to note down some reflections on the material aspects of a country so cursed by bureaucratic tyranny as this is. Forcible repression seems to have been suspended only for want of something to suppress, and I venture to write before another storm shall burst, and perhaps make it impossible to communicate the result of some recent investigations.

The development of fireproofing manufacture in Russia appears to be but little understood in the western world, as little perhaps as the progress which has characterized the "Russian advance" commercially along other lines of eastern activity.

Let me call attention in the outset to a distinction necessary to be made between the practice in the leading cities of St. Petersburg and Moscow and the native primitive methods which find expression in the buildings and homes of the villagers and peasants. A Russian village generally consists of one long street, and a broad one, too, for your Muscovite is a lover of magnificent distances. At the end of this street stands the inevitable Greek Church, and this with the cottages are almost invariably of wood.

"In fact," says Gilbert in his *Russian Illustrated*, "I do not recollect to have seen a church of brick or stone anywhere but in the cities; and the streets themselves are oftentimes laid solid with the trunks of trees."

This is the case also in most of the "little cities" and the practice is so well-nigh universal as to have given rise to the Russian expression, "Cut me a town," in lieu of *build me a town*, for the immense quantity of wood, particularly in the southern provinces of the Empire has the double effect of rendering the material cheap and readily accessible. But it is in the cities our interest lies more nearly. "The old capitol of Moscow," says Clarke, who was by no means a "non-jaundiced" observer, "is in everything extraordinary. Spires glittering with gold, rising amid burnished domes and painted palaces, appear in the midst of a vast open plain over whose surface are scattered a wide variety of homes and hovels of every imaginable style of architecture and in every conceivable condition of construction. You look in wonder for what has become of the city and where you are 'till you are ready to ask once more, 'How far is it to Moscow?' and they tell you 'This is Moscow'—a universal building congress; huts from the arctic, palaces from Denmark, palaces from the Tyrol, mosques from Constantinople, Tartar temples from Bacharia, pagodas, pavilions and verandas from China, cabarets from Spain, dungeons, prisons and public offices from France, architectural ruins from Rome, terraces from Naples and warehouses from Wapping."

Such was the ascetic Englishman's impression of "Holy Mother Moscow," a city which, since its great act of patriotic immolation (the self-destruction in 1812 upon entry of French under Napoleon) has been gradually changing its Asiatic model to that of modern Europe.

Conflagrations many and disastrous have wrought changes in Moscow methods of construction, until to-day the rebuilding of old properties and the erection of new ones is largely after the later practice of fire-resisting construction, if not actually fireproof in purpose and effect. To the American first of all, Moscow has a fire-fighting department of municipal service of the most modern type; the fire engines are American. In the villages it is ridiculously the reverse.

Let me quote an amusing passage from one of our best-read Russian travelers. He says: "Water is a luxury in Russia, and where there are no fine engines or water in canals, rivers, etc., it is not easily obtainable and in the towns of the Cossacks of the Don a remarkable regulation exists for the extinction of fires. On a board set up against the fronts of the cottages are painted the figures of the instruments which every housekeeper is bound to have in readiness, and to attend with them, wherever a fire occurs in the neighborhood. Thus, for instance, at one door is painted the representation of a hatchet, at another that of a water-barrel, and at a third, buckets, crow-bars, ladders, etc." But among the most amazing emergency tactics ever employed is that which prevails in some of the far eastern villages where the fire-fighting squad actually throws fresh *milk* upon the burning house in superstitious confidence in the superior quenching powers of the lactic fluid.

This strange practice is said to be common also among the more remote German villages of the Kaiser's far eastern frontier. In the cities, however, even of the second class, the best modern fire-fighting apparatus is now in use—much of it of American manufacture and the firemen are drilled to a degree of efficiency born of rigid discipline and a plenitude of conflagration opportunity.

Station routes are regulated to a nicety, each of them sending two engines, while the firemen are carried independently and more rapidly by specially built light carriages in order that they may arrive in advance of the apparatus and prepare for its arrival.

In addition to the electric signal service large "fire watch towers" are erected in each city district and men are stationed within them night and day to give notice of any unusual appearance of fire. In addition to these regulations each police office has a drilled fire brigade for emergency service, as is the English practice.

The Russian insurance office established in 1884 now controls most of the underwriting of the cities, which is practically all that is written in the empire.

So common indeed are village fires in Russia and so indifferent are the people, that scarcely a summer or a fall passes that the "red cock" (as they call a conflagration) does not sweep unrestrainedly all over the northern part of Russia. So accustomed are the peasantry to the fact that, upon noticing a neighboring fire-calamity in full progress, no other comment is provoked than to say, "There, the fires have set in already."

Architecturally, Munich is said to be the closest analogy to St. Petersburg; both have been forced into rapid growth and rapid building. Yet St. Isaac's Cathedral in St. Petersburg may safely venture in comparison with St. Paul's, for the style of the two buildings is similar. An American friend always talks with enthusiasm about "that greatest and grandest of all architectural conceptions, the idea of the dome, here glorified in *true Russian*, not so much by magnitude of proportion as by decorative splendor, heightened to the utmost by a surface of burnished gold and grand alway."

In this great and chiefest of Russian churches, liveliest interest attaches to the gigantic monolithic columns.

One writer says, "I could scarcely believe my eyes when first I stood beneath the stately porticoes and looked from top to bottom of the forty-eight Corinthian columns, each 7 feet in diameter and 60 feet in height of smoothly polished Finland granite," except Pompey's pillar, the largest monoliths ever hewn by the hand of man. The pile foundations of this great structure cost $1,000,000 in gold and measured complete 364x315 feet. The summit of the Greek Cross above the cupola is 336 feet from the pavement below and a veritable colossus of iron, stone, brick, granite, marble, bronze and gold!

In the palace of the Kremlin in Moscow the wood construction has been and is now being largely replaced by brick, stone and *fireproofing in the form of the large flat slabs of fire brick which are the Russian adaptation of that which in our American practice takes the form of hollow tile.*

An authenticated incident is that one of the constituent parts or wings of the Kremlin built originally of wood collapsed upon the introduction of "cements and stones" into the construction, during one of the periodical repairing spasms of Russian government activity.

The Grand Palace of the Kremlin is a modern structure completed about 1850. As a specimen of Russian architecture it is regarded as a superb type of rational construction. By no means rich in building stone it is not surprising to find a generous use of brick and tile with ceramic facings. In fact, the rapid evolution of clay as a building material and of the clay interest generally in the land of the Czar appear remarkable to our unaccustomed eyes.

But John Martin Crawford, United States Consul General to Russia in his last report entitled, "The Industries of Russia," writing under the caption of "Ceramics," says that in the government of Novgorod the *fire clays* are very abundant; among them several kinds which would astonish the American observer by their extraordinary qualities and peculiarities; for example, the so-called "*velgheysk*" clay found near a tributary of the river Msta; another variety called "*soukhars,*" found in the Borovichi district, *which form no paste with water;* besides many other strange and surprising characteristics.*

"Large factories," says the report, "have sprung up in this section of the country, the clays themselves losing in the firing process less than 12 per cent."

Until recent changes in the tariff, however, Russian prejudice has been strangely partial to the English brick and tile to such an extent indeed that the words "English" and "fireproof" are synonyms when used in referring to the fire-resisting quality of clay products, and "English bricks" in Russia mean fireproof bricks or tiles.

In the Borovichi district, however, the manufacturers have fought successfully against the imported product and the Borovichi stamp, popularized by the special efforts of N. P. Gorizontov and his colleague, Vachter, have resulted in a full development of the deposits mentioned and the establishment and grouping of factories there.

"To Mr. Vachter, especially," says Mr. Crawford, our American representative, "is due the credit for developing this now great Russian industry. Through his efforts a considerable impetus was given the fireproofing industry *as early as 1886*, when he secured a more or less prohibitive duty against the English importations. And, again, in 1891, an increase in the prohibitive tax to 4 kopecks in gold per pound.

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*We have recently seen some remarkable specimens of burnt clay, which were brought from Russia by Mr. Rossi, superintendent of the National Fireproofing Company at New York City. They can be seen at the office in that city.—Ed.

The production of fireproofing materials at the manufactories of K. Z. Vachter has now attained to large proportions and comprises not only the manufacture of tile, fire-brick, and common brick, but the production also of a series of special articles used in factories requiring a high temperature, as for example, the massive molds and abutments used in furnace construction, gas retorts, vaults in muffle furnaces, in fact, everything under the title of "shamoting," which is the Muscovite or Russian term for "fireproof."

As far back as 1888, Vachter's product amounted to 15,000,000 pieces annually, and though originally small as compared with our American output, "the splendid initiative" will, as Mr. Crawford says, "undoubtedly serve as a strong basis for the further development of fireproof manufacture in Russia."

Already has the demand for fireproofing materials of clay reached enormous totals. The following figures are taken from the report of V. I. Kovalevsky, director of the Department of Trade and Manufacture of the Imperial Government:

Officially reported production of clay materials, brick and tile for 1892 "for all Russia and Siberia, 850,000,000 pieces. The largest quantity was furnished by the Moscow government, namely, about 140,000,000 pieces; St. Petersburg, 73,000,000. The demand in the City of Moscow alone for the last obtainable annual consumption period was 38,000,000 pieces."

Drain pipes also and conduits in the Russian Empire are almost exclusively of clay and the annual production has lately reached the most enormous proportion. The following totals are from a table prepared by M. Kovalevsky, comprehensive of the clay industry of all Russia.

Number of factories, 47; value of production in rubles, 4,404,000; number of men employed, 7,269; women, 1,600; average wage per month (estimated) 8 rubles.

The Czar's great winter palace in St. Petersburg was partly destroyed by fire in 1837, but rebuilt from the original drawings. Eighty feet in height, it has a frontage of 455 feet and a breadth of 350. The architecture is condemned generally as "bombastic rococo; the decorations overcharged; the surface of the façades mercilessly broken up by pilasters—and all washed with a brown-red terra cotta verging toward yellow."

Structurally it follows the modern type, brick, "shamoting" (fireproof) in the newer restorations, and covered with a gigantic roof of wrought and cast iron. Like all of the greater building achievements of Russia, the winter palace is an enlarged ensemble of western models.

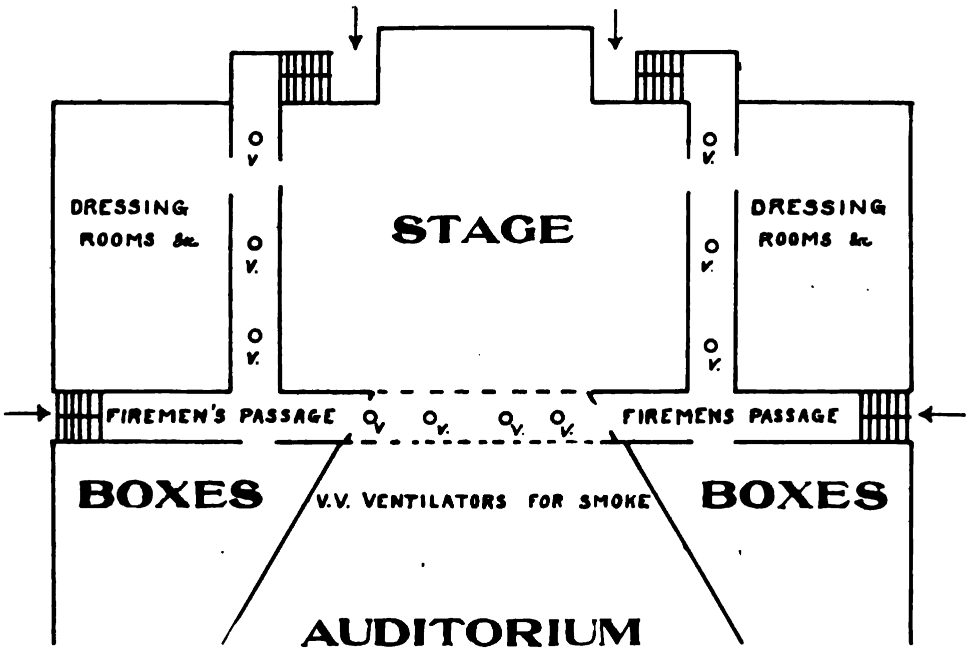
A strange misuse of columns, however, is that commented upon so frequently by the American architect who travels to the frozen north. One of them, says: "Columns, here (in Russia) the common and constant expedient, are almost invariably mismanaged; they are, as it were, gratuitous intrusions, and fail to compare with the rest of the building." The great mistake, broadly speaking, of the Russian architect *professionally*, is conceded to be *"his failure to gather together the scattered elements of a national style,"* but however this may be, whether a right or a wrong criticism, the tendency is toward substantial betterment of conditions, the growing use of fireproof materials in construction, with the ensuing promise of greater safety and greater prosperity for the greater Russia of to-day, or the divided and enfranchised Russia which is one of the possibilities of the present agitation for liberty and human rights.

DOUBLE IRON FIRE CURTAIN FOR THEATERS

Hannover, Jan. 31, 1905.

THE terrible disaster in Chicago, principally occurring from the failure of the iron fire curtain to close the opening between the stage and the auditorium, has led the chief of the Hannover fire department, Herr Reichel, to submit to the fire departments and to the theater managements of Germany a plan for the employment in all new theaters of two such sheet-iron curtains, one on the inner face and the other on the outer of the proscenium opening, independently acting and separated by a space of about five feet. This insures the closing of the stage opening by either one or the other of these automatic iron curtains, in case the other does not fall to the full limit, and where both perform their duty thoroughly there is a double protection against the passage of flame or smoke from the stage forward, and further, an air space of the full height of the theater, which, besides being a nonconductor of heat, serves as a passage for the firemen, for Herr Reichel proposes to prolong this space or lane clear across the building and provide it with entrance doors from the street or court on each side, and also with communicating passages running backward to the rear wall of the building, where there are also entrances for the firemen. This passage is naturally to be kept entirely free from all impediments, and especially from combustible material. Above there should be automatic ventilating openings. Doors from this lane or passage communicate with the stage and also with the dressing rooms or other apartments on each side of the stage proper. The illustration shows the proposed arrangement, which has met with the approval of many of the highest authorities in this line, and further, like other of the inventions of Herr Reichel in connection with his calling, is not, and will not be, patented.

Dr. Robert Grimshaw.



HOLLOW TILE, ITS STRUCTURAL VALUE FOR BUILDINGS*

BY E. V. JOHNSON.

AS a building material, used in combination with steel beams, columns and girders, the many and varied systems of hollow tile are familiar to architects, engineers and builders, having been generally used for fireproofing purposes during the last thirty years.

As a material possessing valuable units for structural purposes, hollow tile is comparatively but little known.

It is to the structural value of this material for building purposes that I propose to confine my remarks, and endeavor, by views and illustrations of actual structures, to inform you, in a limited way, of the many uses to which hollow tile has been successfully and economically applied to modern requirements of buildings.

During the last five years, there has been an energetic effort made to introduce reinforced concrete as a substitute for steel in the erection of buildings; more or less success has met these efforts, concrete, with reinforcing metal tension bars being used entirely for the walls, floors, girders and beams.

The fact, however, that concrete of itself develops only an ultimate compressive strength of from twelve to fifteen hundred pounds per inch, necessitates a great deal of superfluous material, thus occupying increased area in the building in order to make the columns and beams of sufficient strength to carry the superimposed loads.

I claim that we can construct any form of building, or structural part of a building, using hollow tile in compression and steel fabric and rods in tension, and the thickness and weight of the wall, and the size and weight of the material in the columns and girders, will be one-half the volume of concrete construction, and will develop double the carrying capacity.

From this it will appear that hollow tile is much better adapted for the purposes above described than reinforced concrete.

To assure you, however, of the reliability of these statements, will require more than my unsupported word, but later on I propose to tell you how and why we are able to make this statement, and I know that it will be necessary that the proof be full and conclusive.

My first experience with hollow tiles dates back to 1877, at which time the material had a limited use, being employed only as a filling between floor beams in the place of the then-universal brick arches.

No attempt was made to protect the columns or girders from the effects of fire with fireproofing material, as we assumed the ironwork to be fireproof of itself. Later disastrous experiences with fires changed these views materially, and with the increase in the height of buildings has followed a thorough and comprehensive scheme of fireproofing of all structural steel members in a most careful manner.

After the tile system for floors had been built in place and been successfully tested and accepted by several leading architects, hollow tile was then employed to build light partitions, for dividing various floors into rooms; also for roofs and furring on the interior brick walls.

More or less effort was made at about this time to have this material accepted for outside walls and interior bearing walls, but the high cost price of hollow tile, together with the skepticism of the average owner and builder, made it difficult to introduce hollow tile in competition with brick and stone, and for this reason, until a few years ago, the use of hollow tile as a building material was confined almost entirely to fireproofing purposes.

When hollow tile was first placed upon the market, it became necessary to secure the approval of the leading architects before it was possible to make any sale.

On account of the very nature of the material itself, and its hollow form, the first impression on the average architect was decidedly negative to the merits of the material.

I recall clearly one of my first efforts to exploit the advantages of hollow tile arches for floor construction as a substitute for brick arches and concrete.

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*A paper read before the Chicago Architectural Club, February 20, 1905.

The architect to whom I submitted drawings of the proposed construction stood high in the profession in this city at that time, but in spite of my most strenuous efforts, it was impossible to remove his prejudice against the use of hollow tile.

After reciting all the defects imaginable (and they appeared to me unlimited), this architect stated as his opinion that hollow tile had no merit as a building material for structural purposes, owing to its hollow form and consequent lack of compressive strength.

To illustrate his views, he said a building material used in masonry should be solid, in order to resist compression, and he would as soon think of filling the spaces between the beams with empty egg shells as to use hollow tile.

He then took my sample of tile, laid it sidewise upon the floor, and, without much effort, broke it with the heel of his boot.

For the time being I was "jarred," but recovered sufficiently to suggest that even an empty egg shell, subjected to end pressure, would develop a compressive strength many times in excess of the pressure that it would withstand sideways.

At this time, however, we were not selling end compression arches, the tile manufactured in those days being known as the side compression system; hence, my argument failed to carry very much conviction, and, after a few more hard raps, I retreated from the gentleman's office, more or less discomfited.

A few years later, however, this same architect specified in a large building, since erected in Chicago, the identical form of floor arch which he had so vehemently condemned; all of which proves nothing if it does not convince.

I mention this incident to emphasize the difficulty of introducing new ideas to our professional friends.

It seems natural to the majority of men to take adverse views of the merits of any construction, design or plan with which they are not familiar, or upon which detailed information is not laid down in text-books; hence it is that many excellent ideas of value to the world are buried at their inception, because it is not considered profitable nor convenient to the average builder to run the risk of anything in the nature of an experiment or innovation on the regular order of building practice.

Every advance made in the use of hollow tile for fireproofing has been strenuously resisted by the "doubting Thomases," and, I must say, there are a number in the architectural and engineering professions; but, notwithstanding these difficulties, the material has steadily grown in popularity, and is to-day accepted as a general commodity for fireproofing purposes.

Having met many reverses during my building experience on account of the lack of official technical data with which I could satisfy the doubts and misgivings of those professional men to whom new ideas have been presented, I came to the conclusion that the only way to "cross-cut" to the desired end would be to furnish our own formulas for data as to the strength, fire-resisting qualities, etc.

With this end in view I carried on a number of tentative experiments, and made numerous and varied tests of blocks of this material, at various testing stations in this country, both for compression and tension, to demonstrate that hollow tile could be manufactured and successfully employed as a material to carry heavy weights in the walls, floors and partitions; and also for the construction of columns and girders, in combination with steel tension members. The results of these tests of single blocks of material were not conclusive to the practical builder, for the reason that the conditions that really exist in practice were absent, leaving too many factors to be determined by comparative calculation.

I am pleased to state that the company, with which I am now associated, took a broad view of this question, and is, at the present time, conducting, at its own expense, under my direction, a series of practical tests at its testing station, designed especially for the purpose, at Twenty-fifth and LaSalle streets, Chicago.

I will exhibit, later, stereopticon views showing this testing station, exterior and interior, together with the mammoth testing machine especially built and designed for the purpose by R. D. Wood & Co. of Philadelphia.

This machine (see illustration) is operated by hydraulic pressure, using a thirteen-inch ram, with a twelve-inch stroke. The uprights are six-inch square hammered steel of sufficient height to enable us to compress a section of wall three feet long and fifteen feet high, and to exert thereon an ultimate vertical strain of four hundred thousand pounds, or two hundred net tons.

With the same machine we are able to test beams twenty feet in length; also sections of floors, girders, etc.

Immediately adjoining the machine house we have built a fire test kiln, to enable us to make practical demonstrations of the fire-resisting qualities of all forms and materials employed by us in the building.

All tests made at this station are under the charge of engineers who have instructions to conduct them strictly on their merits, and I am authorized by our company to state that if any doubts are expressed as to the accuracy and efficiency of such test reports as we shall from time to time publish, that our company will, at its own expense, duplicate, under the personal direction of our critics, any tests made, and will guarantee that the tests, if conducted in strict accordance with our printed reports, will give practically the same results.

In making these tests we have, in each case, built up a section of wall, floor, column or girder of full size, and laid with the kind of mortar specified for the purpose, the object being to make the demonstrations as nearly as possible like the actual conditions that would exist in building practice.

Having, therefore, determined by practical

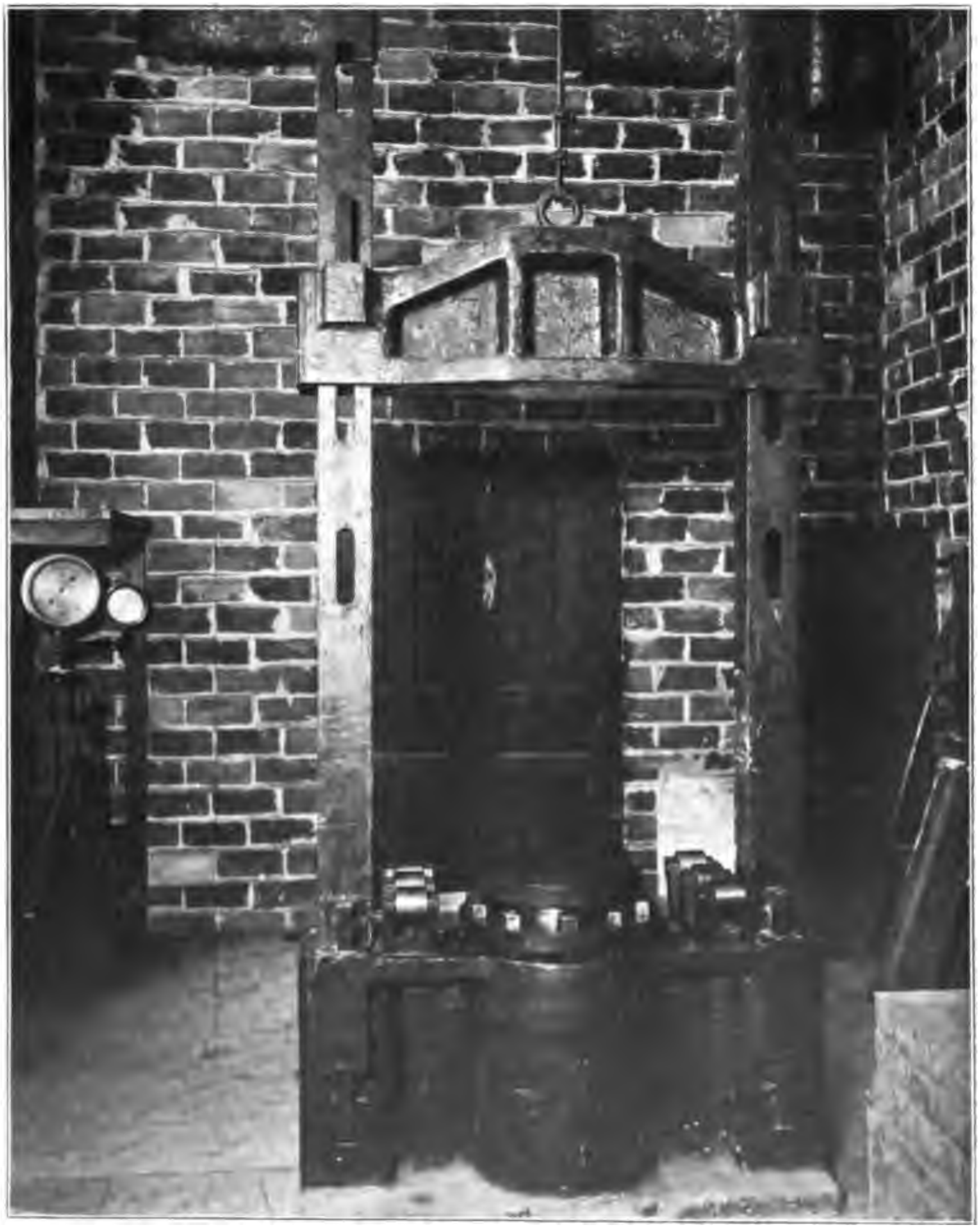


FIG. 1. NATIONAL TESTING PRESS.

demonstration the units of value of hollow tile for structural purposes, I feel justified in claiming for this material great economic and structural advantages over wood, steel, brickwork or concrete, for building purposes.

While I do not claim that hollow tile, as a structural material, can or will entirely displace any of the above standard materials, I do claim that when the architects and engineers become fully informed of the great compressive strength of this material, as compared with its weight, and its economic value, used in combination with steel tension members, that a greatly enlarged field will be opened for its use in the erection of every character of building construction.

The stereopticon views shown you to-night will portray a modern up-to-date apartment building, constructed from the base of the foundation walls up to and including the water tank on the roof, entirely of burned hollow clay tile.

In this structure no steel columns, girders or beams are used. The exterior and interior hollow tile walls carry the hollow tile floors from story to story; the stair risers and treads are

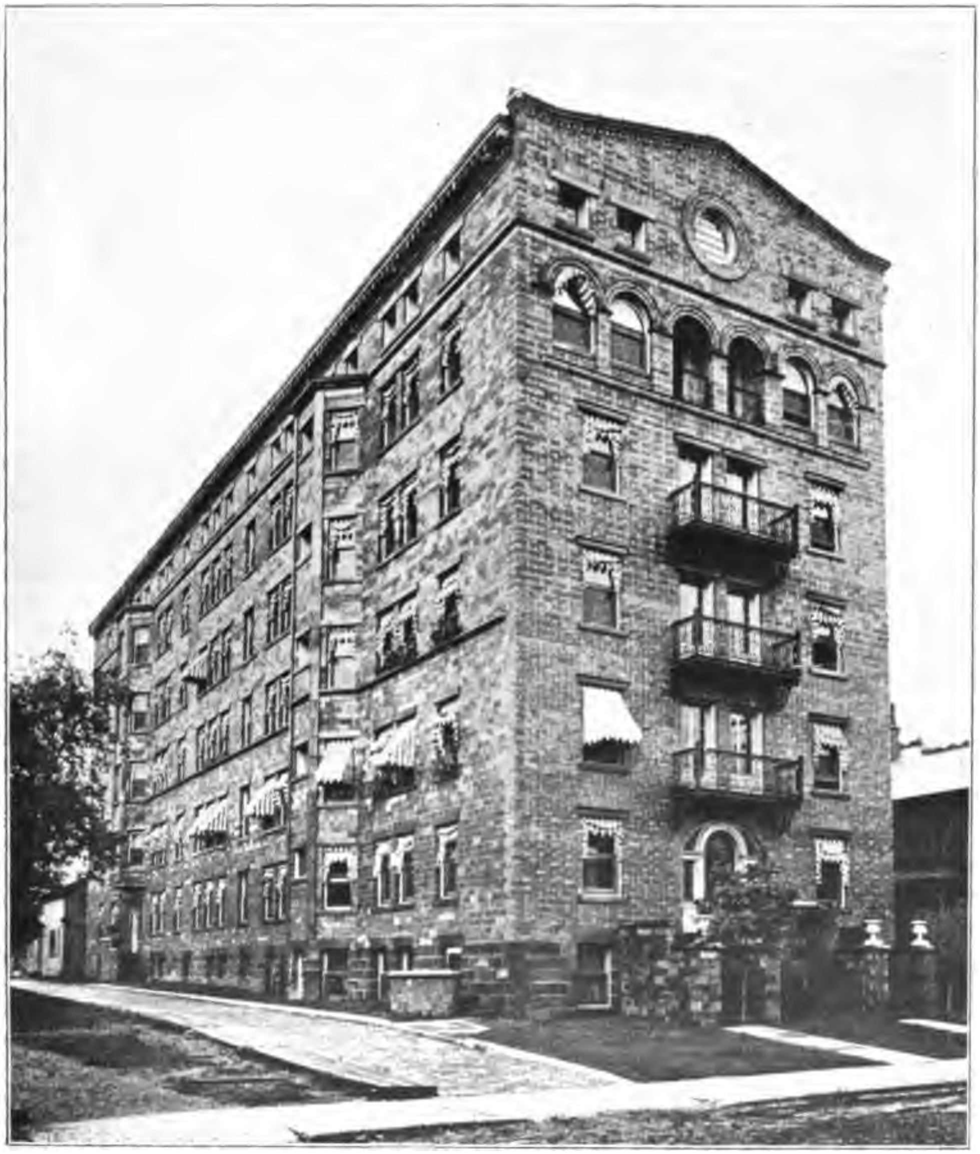


FIG 2—AMELIA APARTMENT HOUSE AT AKRON, O., ALL BUILT OF HOLLOW TILE.

also of this material, as well as the wainscot, architraves and picture molds. No wood was used for the floors, the finish being a composition of plaster and ground wood pulp, spread directly upon the tops of the tiles, a narrow nailing strip being run around the edge of the floors, so that carpets could be easily attached.

The exterior walls used for this structure are of various sizes and color of hollow tile, in combination with pressed and rock-faced brick. The supporting partitions on the interior are built of regular hollow tile, laid with the hollows vertical, and then plastered with rich plaster.

The apartment building above referred to (see illustration) was erected by and under the supervision of Mr. H. B. Camp of Akron, Ohio, who has long been identified with the clay manufacturing interests.

Mr. Camp has shown his faith by investing his own money in a dozen or more of factory, apartment and office buildings in the state of Ohio constructed with hollow tile in the manner described. All of his buildings have proven satisfactory and profitable investments.

The floors are what is known as the Johnson long span hollow tile floors, which are fully illustrated in the views.

This system of floors, while not generally known in Chicago, has been used for the past five years, and with entire satisfaction, for railroad stations, hotels, apartment buildings, private residences, churches, hospitals, office buildings, etc., and there are at present five million square feet of this system erected in place.

There is an apartment building at Forty-fifth street and Lake avenue, Chicago, in which the floors and roof are built of eight-inch tile, with a clear span of seventeen feet between beams, and supported upon the exterior brick walls.

Recently ten-inch hollow tile were used to build the Johnson system floors of the Lincoln Center Church, on Oakwood boulevard and Langley avenue, this city. The spans on these floors, between girders, are twenty-two feet six inches in the clear.

This work can be seen in the rough at the present time, as the building has not yet been plastered.

You young men, starting out on an architectural career, should take advantage of the results so far accomplished by the use of hollow tile, and study the material with a view to its use in the construction of every form of building, from the modest laborer's cottage to the twenty-story skyscraper, for the entire exterior and interior construction; also, as a structural substitute for wood and iron columns and girders.

I will show you a material to-night that has a compressive strength, varying from four thousand pounds to twenty-one thousand pounds per square inch!

We can manufacture this material and guarantee a uniform working compressive strength of one thousand pounds to the inch, with five factors additional for safety.

You can easily figure out yourselves the thickness of wall, the sizes of tile, the thickness of shell and the weight of the material you may employ in the construction of floors, walls, columns and girders.

From the tables of strengths of this material which we will furnish from time to time, all of the data requisite to enable you to take advantage of this valuable structural material will be at hand.

Why use dense, heavy material, like solid masonry and concrete, when more efficient results can be obtained with a material only one-half the weight, and possessing three times more compressive strength per inch than concrete or brickwork?

This is especially true of high structures, where the weight on steel girders, columns and foundations is of paramount importance.

Why not employ hollow tile for court walls of buildings? It can be manufactured in ornamental form and, being hollow, with great compressive strength, can be built to the requisite height of any modern skyscraper.

You all know that the price of wood has advanced in the last ten years fully one hundred per cent. We are to-day paying $22 per thousand for the same quality of lumber that we purchased in 1895 for $9.75 per thousand.

It will not be many years before the advance in the price of wood will prohibit the erection of the present cheap style of buildings, so much in evidence in apartment buildings and residences.

In a recent issue *The Brickbuilder* of Boston has invited competitive plans for a fireproof tile house of modest cost, and offered three prizes for the best design. This is a forceful indication of the signs of the times.

In 1877 there were one thousand tons of hollow tile fireproofing material sold in the entire United States. In the year 1904 there were very nearly two millions tons sold. Ten years from to-day two-thirds of all the new buildings will use hollow tile as the structural material, both interior and exterior.

I believe that hollow tile, made in suitable forms and of assorted colors, also hollow tile faced with brickwork or plastered on the exterior surface with ornamental stucco, is the material best adapted to take the place of wood, both for interior and exterior construction of buildings, and base this opinion upon the following claims:

First—Tile is the lightest and strongest material for building construction.

Second—It furnishes a perfect surface for the receipt of plastering, both old style lime mortar and patent plaster.

Third—Can be laid at any season of the year, regardless of rain, frost or extreme hot weather.

Fourth—Can be plastered upon within forty-eight hours after being laid in place.

Fifth—The tile, being hollow, serves as a non-conductor of heat, cold and sound, assuring a warm house in winter and cool in summer.

Sixth—Does not shrink, thus causing disfigurement to plastering and decorations.

Seventh—Being non-combustible, there is no necessity to carry insurance.

Eighth—It is impervious to climatic influences, and time-enduring, assuring the minimum outlay for annual repairs.

If there are any disadvantages in the use of hollow tile, other than first cost, they have not made themselves apparent to me in practice.

Throughout the state of Ohio there are a great number of different classes of buildings that have been built of this material, using the standard eight-inch by eight-inch hollow building blocks; owners and occupants of which, when consulted, have in every case expressed themselves entirely satisfied with the material.

There are large factories in almost every state of the Union engaged in the manufacture of clay products, and the selling price of this material is being decreased gradually every year. At the same time, the price of lumber is constantly on the advance, and it will be only a short time when the owners of buildings will find it to their interest, on the grounds of economy of first cost, to use hollow tile in preference to any other material.

The demand for this class of construction is surely coming, and the young draftsman of to-day, who will be the architect of the future, will be called upon to furnish the plans and designs for the buildings.

The practical examples of structures already erected and in use eliminate the objection that may be raised on the ground that this system of construction is new or untried.

It is for this reason that I have dwelt so particularly upon the results of the tests that have been made, and are now being made, so

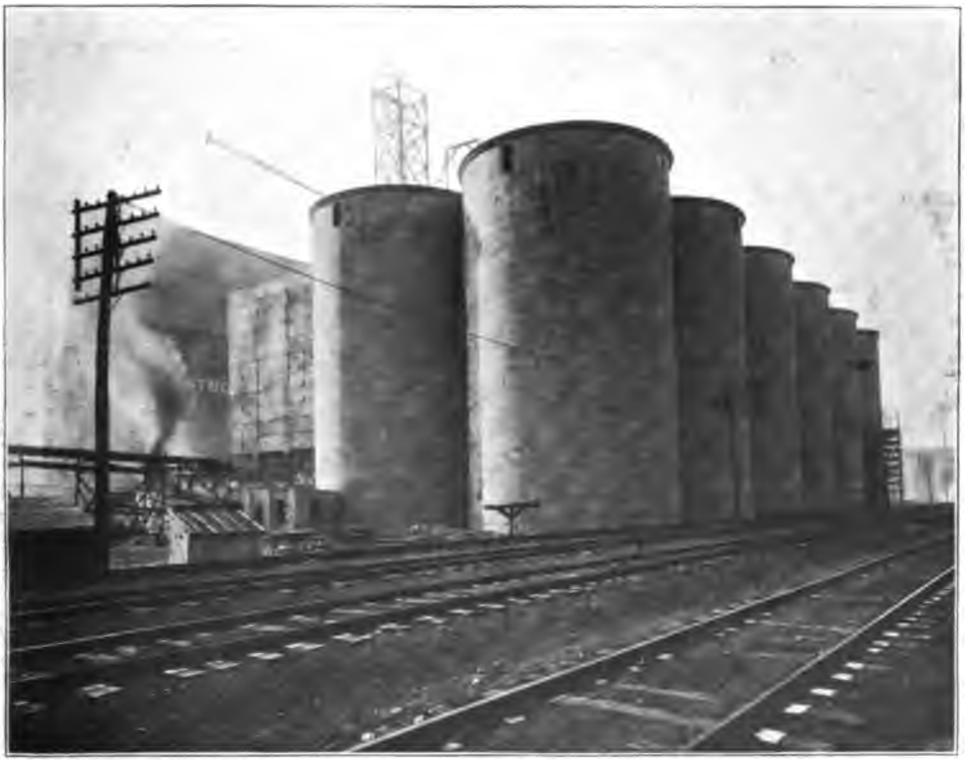


FIG. 3. GRAIN TANKS AT MINNEAPOLIS.

that architects may be fully informed upon the actual unit values of this material, and also the latest improvements being devised for its economic application to building construction.

To justify some of my claims as to the strength and adaptability of hollow tile for carrying enormous loads in building structures, I shall show you views of several large fireproof grain warehouses, constructed during the last five years with hollow tile.

I refer especially to sixteen large isolated tile tanks built at Minneapolis, Minn. These tanks (see illustration) are fifty feet in diameter and ninety-five feet in depth and they each have a capacity for storing 125,000 bushels of grain.

The walls of these tile tanks are constructed with two thicknesses of tile, the inner course being composed of hollow blocks six inches thick, twelve inches square, and the exterior course being seven-eighths-inch thick slab tile, secured to the inner course with metal fabric anchors. This outer course or facing tile is primarily for waterproofing purposes, but acts at the same time as an additional fire protection to the interior tile.

The two tiles, when laid together, form a wall slightly in excess of seven inches in thickness.

The contents of the tile tank weigh over 3,500 tons and the walls themselves have to support an actual live load of ten tons per lineal foot.

(Mr. Johnson produced on the screen at this point drawings illustrating clearly how these tile tanks are constructed, showing the method of applying the steel bands to provide the necessary tensional strength to resist the thrust, and also the form of tile used in combination with the steel tension members.)

I spent five years trying to induce several prominent engineers to investigate this system of construction and pass upon its safety. Three prominent eastern engineers turned down the idea to their clients as dangerous and impractical.

Failing, therefore, to receive the technical support of the talent, together with my associates, we erected an experimental tile bin in the city of Minneapolis for the Osborne-McMillen Elevator Company.

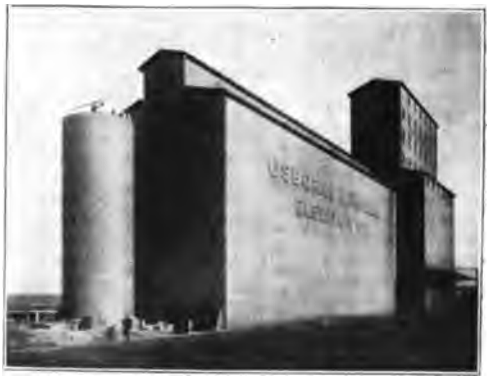


FIG. 4. TANK OF THE OSBORNE-McMILLAN ELEVATOR COMPANY, MINNEAPOLIS.

After this tile tank was completed and filled

FIG. 5. SETTING ROOF ON NEW CHICAGO POST-OFFICE BUILDING.

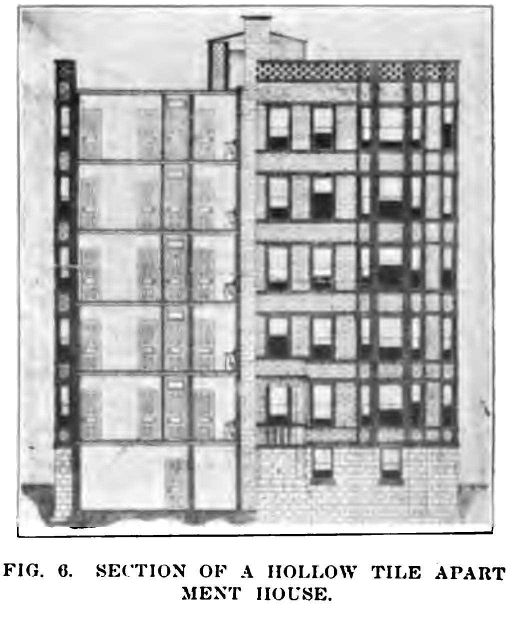


FIG. 6. SECTION OF A HOLLOW TILE APARTMENT HOUSE.

with twenty thousand bushels of grain and allowed to stand six months we were able to secure a contract for the erection of our system, upon personal guarantee of its efficiency, and since the first tile tank was erected in 1900 we have since contracted for and erected, in different parts of the country, over seven hundred bins, with size varying from fourteen feet in diameter to fifty feet in diameter.

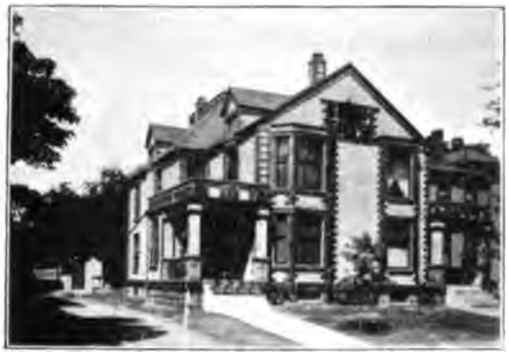


FIG. 7. A HOLLOW TILE COTTAGE.

From the showing of strength and adaptability, as developed by the seven-inch wall for the grain bins above described, I feel justified in claiming for properly designed hollow tile construction that, as a structural material for masonry, it has no equal for strength (as compared with weight) and adaptability to all parts of building structures where economy of space, ease and facility of installation and resistance to fire and climatic influences are desired.

A COMPARISON BETWEEN "MILL CONSTRUCTION" AND FIREPROOF CONSTRUCTION, WITH SOME COMMENTS ON THE LATTER

BY F. ELLIOT CABOT.

IF anything were needed to emphasize the words of Mr. Atkinson in our March number, we could find nothing better than what is said in a paper read by F. Elliot Cabot, secretary of the Boston Board of Fire Underwriters before the Boston Architectural Club, from which extracts are given below: His remarks on the misuse of so-called "fireproof" methods, through bad planning and the neglect of accessories, are equally pertinent. Mr. Cabot said in part:

Of the types of construction which have been most prominent of late in the minds of the public there are two which probably are to-day better known than others. These are "mill" construction—so called because it was supposed at least to be patterned on the standard of the best types of construction for manufacturing plants—and the so-called "fireproof" construction.

Both of these types have been presented to the public as panaceas for the enormous fire loss of this country (a destruction of property which is as truly a loss as if the money value represented by it had been thrown into the sea), and both of them have, in some forms of their development, failed entirely to prevent this loss.

The reason for these failures are matters of careful study by active-minded men, trained for the purpose, and once understood will be as surely overcome as other engineering problems have been.

In the case of the so-called "mill" construction the error seems to have been twofold: First, in the application of this construction to work for which it was not intended; and secondly, in a failure to carry out fully and properly the principles upon which this form of construction was based.

This type of building was originally designed to cover in and protect from the weather large manufacturing establishments in which strength and not beauty was the leading requisite. It was designed to remedy certain defects which had appeared in the earlier type of building used for manufacturing purposes, such as concealed hollows in walls and floors, unduly combustible roofs and passages for fire, but not for firemen, from one part of the building to another; and it did overcome such difficulties to a very reasonable extent. It also improved the lighting, heating and ventilation of buildings for such work, and, in combination with the probable contents and the very excellent fire-fighting apparatus which was provided succeeded largely in furnishing a satisfactory substitute *(for mill building)* for the "combustible architecture" which had preceded it. It must, however, be kept in mind that compared to the city building to be used for the "storage and sale of merchandise" the mill, even the cotton mill, contains but little combustible contents, and that the mill, though often containing large unbroken floor areas, is of comparatively slight height.

When, therefore, the success of this construction (which was really the first work of the insurance engineer) in reducing the fire loss in mills brought it to public notice and the attempt was made to adapt it for use in stores and warehouses, no adequate provision was made for the changed conditions. The requirements of trade called for offices and counting rooms; they were partitioned off with hard pine sheathing. The shape and size of city lots made it difficult to put the stairways and elevator shafts in separate brick towers, as they are in the best built mills, so the stairways and elevators were put inside the main walls of the building and were left unenclosed or only partially cut off. The desire to have attractive salesrooms led to the use of varnish in place of plain wood, or better still, well whitewashed surfaces. The necessary crowding together of buildings in cities makes thorough protection of outside openings most important. But shutters interfere with light and require attention which, without mill discipline, was not easily secured, so shutters were neglected or often omitted.

The use of such buildings to house several tenants under one roof made the mill discipline impossible and increased materially the danger of fire from rubbish, from careless use of matches, from many other well-known causes. The lack of skilled mechanics as part of the working force of such a building was no doubt a reason that proper fire-fighting facilities, as a part of the equipment of the building, were not more commonly provided. In short, there was an attempt to use "mill" construction for warehouses and stores without keeping in mind its essential features, which briefly are: No "vertical openings," no "concealed spaces," the minimum of "combustible finish," with ample facilities for extinguishing fire at its discovery, and ample protection from outside exposure. Under these circumstances it is not surprising that "mill" construction did not for city warehouses fulfill all expectations. Yet I do not feel that the construction was to blame, but the use made of it. Railroad semaphores are a necessary part of railroad equipment, and especially so in these days of fast trains, yet I once heard a first-class engine driver say that "they got in the way like thunder when you wanted to make time," and I fear that this is the feeling of many merchants and owners of buildings as to the essentials of mill construction.

In the case of "fireproof" construction, difficulty seems to have come from a different cause. As in many other matters, the American tendency to go to extremes has resulted in undertaking the construction of enormous buildings, limited only by the strength of materials as to height and by the ground available as to area. In constructing such vast buildings it has been assumed that because a material would not under ordinary conditions burn, it was therefore "fireproof," or at least reasonably "fire-resisting." The enormous expense required by such construction has led to economies which have proved dangerous and to methods which fire has tried and found wanting. No one who saw the United States government warehouse at Baltimore soon after the awful conflagration of last year can have any doubt that it is possible to build a warehouse of reasonable size which would even under the terrible strain of such a fire as that be a protection to the merchandise within its walls. If it had not been for the alteration in its original form, made necessary by the introduction of a modern elevator, I doubt whether the expense of repairing that building would have been more than the cost of glass for the windows and a little paint and putty.

It may be said that this building was not exposed to the extreme test of those awful hours. Yet buildings all round it were totally wrecked, and it stands to-day in practically its original form, except in the substitution of brick for granite for its interior columns.

And this leads me to a digression from the main thread of my argument. For thirty years every engineer, every architect, every builder of repute, has known that stone, especially granite and marble, while not in themselves combustible, are destroyed by fire almost as readily as wood. If anyone had doubted it before last winter, the Baltimore fire proved it beyond any doubt. Yet I venture to say that there is not to-day a large city in this country in which there will not be during the year 1905 a large amount of marble or granite used in fireproof buildings, and in parts of such buildings so high above the street that the use of water to protect them from fire will be, so far as fire departments are concerned, physically impossible.

Is it possible that the American brain, so fertile in every other direction, is unable to cope with the problem of designing and erecting an attractive and suitable exterior for a building which is *designed* to resist fire?

And now let us return for a moment to the false economies which so often confront the underwriter who, from the business point of view, is endeavoring to fix a proper price for the indemnity which he has for sale.

One of the commoner forms is the slighting or the deliberate reduction of the protection for the steel framing which is the skeleton of all these great buildings. The records of the cost of construction of some of the larger office buildings destroyed in the Baltimore fire show that the marble wainscoting and flooring of the halls in these buildings cost more than the protection of the steel frames, and we know that in one building at least a form or floor construction which was proved to be satisfactory was given up and a cheaper and, as it proved, entirely unreliable form substituted at a saving of one or two per cent of the cost of the building.

Surely such work as this is not worthy of respect, and is not and cannot be remunerative in the long run.

We are asking these steel frames to carry enormous loads, to withstand great strains, and yet we grudge them the slight additional cost of a reasonable protection against fire, not only against a conflagration, but against such fires as have and will occur within the building or its immediate neighbors, and we spend twice the money which the proper protection would cost on decoration which may or may not be good art.

Again, it is a common practice to set interior partitions on top of combustible wooden floors, even when the partitions are made wholly of incombustible material, and as a result a slight damage to the wooden floor wrecks twice its value in partitions and their finish.

We use iron face-plates on the fronts of these buildings and let the adjoining brickwork rest upon them so that a slight expansion of the iron displaces many feet of brick facing. Does it pay? Is it good work? Does the result justify it? Surely not.

In the fireproof building, too, we seem to depart from the construction which is justifiable for such work by the great expense of unprotected windows.

Of course, light and air are most desirable, but from the underwriter's point of view it is fair to expect protection from more than the weather in the best type of building.

Vertical openings, too, have been quite a factor in the destruction of several buildings of this type, especially in those of a great height, as they almost invariably act as a flue to draw the fire from one story to another. If a large office building is to be regarded simply as a stove which will from time to time be burnt out, it is perhaps sufficient to provide for protection to the building itself, but if it is to provide protection for its contents, then the vertical openings and the exposed windows need protection.

I have tried briefly to state why these forms of construction have not been as successful as they ought to have been, and I will endeavor briefly to give the insurance engineer's hope of what may be done to overcome these difficulties.

Considering first the "mill" form of construction, I believe the automatic sprinkler, the fire-door and the fire shutter, with a restricted use of combustible finish, will solve most if not all of our difficulties in this direction. I wish architects and engineers would make themselves more familiar with the use of sprinklers, because so much may be done in the construction of the building to make sprinklers thoroughly effective. A smooth ceiling or one with panels approximately 10 feet by 10 feet or 5 feet by 10 feet will give sprinklers the best chance to distribute the water to the best advantage.

For the "fireproof" building I must, at the risk of being called a crank, urge the use of "wire glass" in metal frames, both for exterior use and where it is necessary to light stair and elevator wells.

Cut off the vertical openings, protect the steel frames everywhere and protect exposed windows, then "fireproof" buildings will come nearer to deserving their name.

WHERE AND HOW THE BRITISH FIRE PREVENTION COMMITTEE CONDUCTS ITS TESTS

WE are indebted to the Builders' Journal (London) for a description of the testing plant of the British Fire Prevention Committee, which here follows: The unusual privilege was given to its representative to examine the plant, see one of the tests, and take photographs. One of the latter is here reproduced. The large pipe in the foreground supplies the gas with which all the tests are made. The gas generator is seen in the distance.

It is not often the fortune of a non-member to be able to attend the testing operations of the British Fire Prevention Committee, unless he happens to be a government, municipal or insurance official. The attendance at such tests is very strictly limited, the members only attending by rotation, and strangers—if they are not official representatives—being only quite exceptionally seen within the testing station grounds. Though perhaps not quite realized, there is always a considerable risk of accident at tests. The volume of flame is considerable and extremely gaseous, and the hazard of a falling wall or a gas explosion is considerable. This is evidenced by the fact that when issuing invitations the committee does not hold itself responsible for injuries sustained by a visitor. No description, account or criticism of a test other than the duly authorized official report is allowed.

It was my privilege to attend the testing operations one afternoon this winter, with special permission to write about what I saw, provided that particular reference to the actual tests undertaken was avoided.

On arriving at the testing station, situated in Porchester Road, Bayswater, some little time before the appointed hour, everything was in readiness for the day's programme. The site is secluded, having quite a narrow frontage to Porchester Road, and one of its boundaries abuts the Great Western Railway. Where there is a possibility of overlooking the site, the portions are screened by the erection of a trellis-work about 30 feet high. The testing plant comprises three testing chambers, two back to back, measuring 10 feet by 10 feet in floor area, and one measuring 22 feet by 10 feet in floor area, the measurements being taken inside the walls. The necessary fire is produced by a large gas-producing plant (installed by Messrs. Mason of Manchester), from which an 18-inch pipe runs to the testing chambers and from which gas is taken into these chambers by the aid of subsidiary pipes controlled by valves. The flame from these gas fires is of great intensity, occasionally streaming like a gigantic burner, but it also spreads from time to time, consuming its own smoke and creating that volume of fire which is such a dangerous factor in actual conflagrations. The temperature of the fire is measured to a nicety with the aid of Robert-Austens pyrometers, pyrometer points being distributed in each testing chamber and the electric current carried by overhead wires to the instrument room.

No fire test would be complete without the very serious water test, for it is often the case that materials will stand quite a considerable amount of fire, but at the veriest touch of water will disintegrate or collapse. This water test is obtained with the aid of a very neat small steam fire-engine.

The actual work of taking a record of what has happened during a test is generally entrusted to a special testing sub-committee, which is formed from among members of the executive and members of the committee. As a rule, at least one district surveyor is on the sub-committee, and then, according to the subject, either an architect or an engineer, and perhaps a fire-brigade officer of an insurance surveyor.

The gentlemen acting on this testing committee have various duties allocated to them, and the tests are conducted with remarkable smoothness; and as the temperature can be made to rise and fall by due working of the valves, etc., practically all the tests may be said to be on uniform lines as far as conditions are concerned. Say a testing operation is intended to involve a temperature of not less than 1,800 degrees at the finish, the temperature to rise gradually to that point, it will be seen time after time how, just at the close of the test, the temperature, which has been gradually rising, is brought to 1,820 degrees, or say 1,850 degrees Fahr.

I noticed at the test a very important government official whose work brings him frequently in close touch with the question of fire and fire prevention, the chairman of the executive, a leading waterworks engineer, and about a dozen insurance surveyors and half a dozen district surveyors; also several architects well known as men of practical and constructive experience. Among the visitors were some of the leading members of the professional and volunteer fire service.

Obviously, occasional meetings on a common subject between men belonging to different though kindred professions must in itself mean a considerable interchange of knowledge and experience. In these instances the primary object is the unraveling of the truth relating to fire-resisting materials, and there is certainly no better subject for debate if one remembers the different aspects in which such materials have to be regarded.

The first test on the occasion here dealt with was a short one, the object being to attain classification as affording "temporary protection" only; the next test was a more ambitious one, when an attempt was being made by the owners to attain classification as affording "full protection"—a classification but very rarely obtained.

The firm whose goods were intended to afford temporary protection passed through their ordeal with flying colors. It was generally anticipated that they would withstand the ordeal of fire, for they had already been through several minor tests; but that they should have also brilliantly withstood a very severe ordeal of water—in this case applied directly at right angles and at about 45 pounds pressure from a steam fire engine—came, I understand, as a surprise. This firm had submitted to no fewer than three tests on previous occasions, doing a little better each time.

It is to firms of this description that the tests must be of great importance. Although perhaps not quite successful at the outset, they learn what can be obtained by some small improvement, and gradually as the improvement is perfected the desired results are obtained.

The second test dealt with one for the "fully protective" class. It was a product presented by an old-established firm of high technical standing. The material beat all records, as far as fire alone was concerned, and passed the ordeal necessary to get into the committee's topmost classification, but during the second minute of the two minutes' water ordeal—through which the work has to pass—there was a collapse, and by about 45 seconds the makers missed their goal. Here again, however, the miss was entirely dependent upon the absence of some small improvements, with the aid of which the highest classification would have been obtained.

The third test was what are called the committee's private tests, i. e., they were a series of tests with sprinklers for the information of the members. Sprinklers of various types and kinds were being examined with a view to ascertaining what they would do in certain practical circumstances, and it was remarkable to see the variations and unexpected results.

The most striking lesson of the testing operations of the afternoon was the realization that a safeguard in matters of fire-resisting construction is only as strong as its weakest point, and that where there is a weak point it must be so strengthened as to meet actual requirements.

I have mentioned the danger attendant on these investigations, but as these tests are veritable clothes wreckers of the first order, many a boot, coat and hat being irredeemably spoilt on such occasions, it cannot be an inexpensive matter for the workers and the members attending and helping in the test, none of whom receive any remuneration, but have to bear all their own out of pocket expenses as well.

TEST HOUSES OF THE BRITISH FIRE PREVENTION COMMITTEE, LONDON.

London has been saved from the introduction of many a material and appliance, generally of foreign origin, which unscrupulous vendors have tried to foist upon a public without first ascertaining its merits through the work done at these testing stations.

A successful test should be the hall mark for a manufacturer. It can only be a matter of some few years before testing operations will be compulsory either by legal enactment or local bylaws, and the sooner this day comes the better. All praise, however, to the body of public-spirited men who at their own expense of both money and time are meanwhile guarding London against the dangers of fictitious so-called "fireproof" commodities being used in building construction.

THE NATIONAL BOARD TO THE RESCUE

THE National Board of Fire Underwriters has published an interesting circular in relation to the formation of its "Committee of Twenty." It thus describes why and how it formed this committee.

The National Board of Fire Underwriters is composed of 120 of the leading fire insurance companies doing business in the United States, and as set forth in the organization papers, its purpose is to influence the introduction of improved and safe methods of building construction, encourage the adoption of fire protective measures and secure efficient organization and equipment of fire departments, with adequate and improved water systems. The board has no control over rates of insurance, commissions of agents, etc.

Knowing that the fire waste in the United States greatly exceeds that of other countries and believing that the Baltimore conflagration would impress upon the public the danger to most, if not all, of our great cities of a like disaster, it was decided to appoint a committee charged with the duty of organizing an engineering department composed of men standing high in their profession and through them to investigate conditions, stating facts as to those existing and making recommendations for improvements that would minimize the sweeping fire or conflagration hazard, especially in the congested or heavy value districts of the cities visited. Accordingly, a staff of engineers has been organized, and to-day there are in the field four parties, each collecting data and making tests in some different city, the work being carried on by men who have had experience in civil, mechanical, structural, hydraulic and electrical engineering.

The engineer of the committee is E. G. Hopson. The work of the committee is under the direct supervision of Herbert Wilmerding, the secretary, at its offices, 135 William street, New York. It is also announced that the United States government has detailed two engineers of the United States Army "to investigate and review the reports of each city, it being the desire of the underwriters that the reports might have final supervision and be criticised by men in no way connected with the business of insurance," and it might have added in no way interested in various "fake" methods of so-called fireproofing.

The circular closes with the following paragraphs, showing that at last the underwriters have awakened to a realization that "conflagrations" are a menace to the prosperity of the nation for which fire insurance is no longer the panacea. We quote them with pleasure, for the warning is timely. But there is a remedy and it may be found spread over the pages of this magazine for the last two years.

A sweeping fire or conflagration is a terrible calamity, and, occurring in one of our greater cities, would wipe out several hundred million dollars of property values, causing no doubt a great panic, from which all of the people of the United States would suffer. It should be borne in mind that, while the insurance companies reimburse the actual sufferer by the fire, the people as a whole bear the burden, and unless the people pay enough for the companies to meet the claims for fire losses, they, the companies, would soon be forced into bankruptcy.

It is a mistaken idea that payment by fire insurance companies makes good the property loss, for property burned is value wiped out of existence, and the insurance companies merely distribute the loss by collecting in small sums premiums from all the property owners and paying in large sums to those who suffer loss by fire.

Property burned is money wasted, and the people of the United States are the most wasteful in the world in this direction. Fire losses being the barometer of insurance rates, it is interesting to note that the fire cost per thousand dollars of value of property insured is twelve times greater in the United States than in Great Britain, where high buildings, large areas, poor flues and shoddy construction are prohibited by law, and it is twenty times greater than in Italy, where the construction is still better and the conflagration hazard practically eliminated.

OUR FIRE BILL A MILLION AND A HALF A DAY

BY F. W. FITZPATRICK.

IN my "Chats" of the last two months I gave some facts and figures anent fires, their cost and dire results, and some suggestions for the cure of the evil that attracted quite a little attention and received some commendation, though, in a few cases, I was called an alarmist and my figures questioned. It seemed to some that the figures *must* be exaggerated and that it was not possible that $230,000,000 went up in smoke during last year. Now, as a matter of fact I have been, if not absolutely accurate, a bit over-conservative in my statements. I have felt right along, and have said in some publications if not in FIREPROOF, that while the reports we receive of some fires are undoubtedly exaggerated, there is a large number of fires that aggregate a considerable total and of which we never hear at all.

The reports we generally accept in estimating fire losses are taken from the fire department returns for the different cities, the insurance adjusters' records, and such sources, but in this case I began preparations soon after the first of January, and planned an elaborate scheme for the securing of complete information. Besides the regular channels of information I drew on many special ones, and received considerable assistance from the newspapers, for even the smaller towns have a newspaper that gets telephonic or other messages from the smaller surrounding villages that have no newspapers. By the 15th of February my plan was in fair working shape so that the returns which began coming in on the 19th and continued until the end of the month may be deemed pretty complete, while for one day, February 23rd, I am convinced that nothing escaped me. I had prepared a particularly elaborate plan which would be all-inclusive for one day and had picked that date at random. The task of sorting and sifting all this information was no small one, for with such a mass of stuff the possibility of duplication, where the same fire might be reported from two or more sources, was imminent, and then, too, I wanted to give my critics the benefit of the doubt by taking the most conservative statement of loss as a basis for my figures. For instance, in the New Orleans fire, where the Illinois Central terminal burned, I have put the loss at $3,000,000 only, while even some of the most conservative insurance experts think the total will pile up to over $4,000,000, if not, indeed, to nearly $5,000,000.

To give you the tabulations as I have them, divided up into West and South and East and North, and under the various headings would be most tiresome reading, therefore I will summarize. It may be well to state here that the *Boston Standard* prepared a summary some days ago which was interesting, though not nearly so comprehensive as the data I have now at hand. It attempted to get all the fires causing over $10,000 damages and totaled up for 54 days in January and February to $25,355,970, or $469,555 a day. For the same period last year, including the Baltimore fire of course, the daily average ran up to $1,251,120. Or, taking the year's loss of $230,000,000 the daily average was $630,000. From February 19 to 28, last, ten days, there were 1,315 fires, each causing a damage of not less than $200, while there were 960 more inflicting insignificant losses that we will not consider, for I have eliminated them from fire department and all records. So that we will call it an even 1,315, or 131.5 fires per day, at least; for as above stated even as complete a system as I had many may have escaped me except on the one day of which I am sure, February 23. The total loss for the ten days was $14,809,800, or $1,480,980 a day! On February 23 I have a record of 165 fires, each causing over $500 damage, totaling $2,015,700, and on that day, be it also said, there were no great conflagrations to swell the total abnormally, no one fire did greater damage than $100,000.

It may be said that that rate may not be kept up all year. Pray Heaven that it may not! True, it happened coincidentally that between the dates I had set to keep this record there were some pretty serious conflagrations, the great fire at Indianapolis on the 19th, the Boston docks on the 22nd, Hot Springs on the 25th and the New Orleans terminal fire on the 26th. But our fire loss in 1904 was $15,000,000 greater than in 1903, and who tells us that 1905 will not exceed 1904? What are we, what are you, my readers, doing to prevent this from being an ever-increasing loss?

The pace set by those fires of ten days seems to have been pretty well kept up since I have ceased giving the records such minute attention. Why, I read in this morning's paper of one fire at Cedar Rapids, Iowa, where, report says, $1,500,000 has gone up in smoke, and surely there is fuel enough left, in our highly combustible country, for a dozen such fires a week!

Remember, too, that this ten-day record of mine does not include fires on railroad trains or ships while under way (an item of no mean importance, when you stop to think that in just one such fire, on a B. & O. car near Connellsville a few days ago, $250,000 in currency was consumed), but it does include such cargo carriers as were burned in stations or at docks, and in connection with buildings, or what we might properly call "fixed stationary buildings and their contents."

Possibly, and I sincerely hope it is so, this particular season of the year is more prolific of fire losses than any other. I do know that in most of the reports from northern cities there was generally something wrong, lack of water, hydrants frozen, or weather so cold that firemen could make but little showing in their efforts to prevent the spread.

One feature of the record that is highly pleasing is that there has been no such loss of life as there was last year. Seeing as much of fire as I do, it is a wonder to me that more lives are *not* lost. When there is a death or terrible injuries to record, we call it an "accident"—to me it's a plain case of accident that really so few *are* killed and maimed and burned. Heaven knows but people have to be alert and trained to the highest degree to evade that almost constant danger in its direst form.

During 1904, 6,772 deaths occurred through fire, or at the rate of eighteen people a day for the year. During these ten days recorded there were but 50 lives lost, or five a day. There were 218 people seriously injured, burned, limbs broken, etc., ten or fifteen of whom are likely to have since died from those injuries; 463 people narrowly escaped with their lives, they were carried out by firemen, slid down ropes, or otherwise more or less miraculously got out from burning buildings or were not injured in the three serious panics which occurred during the period. There were fires in six hospitals, twenty-one apartment houses and hotels and eight theaters, and in all these fires, as near as I can estimate, 36,000 persons' lives were directly endangered. I mean by that that they were awakened at night, had to leave the building in night dress, or were in theaters at the time fire was discovered, or were otherwise in imminent direct peril. To say anything of the indirect peril to people would carry us into the realm of the purely conjectural.

I grant you this is a big country and perhaps since we are dealing with such big figures in the way of production, exports, and what not, we may perhaps be expected to feel a justifiable pride in having so much to burn that we can afford to throw away $14,000,000 in ten days. But stop and think of the drain that is on the country. It isn't export, or an exchange of money from one hand to another, but is an absolute loss to everyone, a complete *extinction* of so much property. I gave you a few suggestions upon which to ponder last month, but it will do no harm to just touch upon this one little point of comparison, though it may smatter of repetition. In February, last year, the total building done in the twenty-three leading cities of the country amounted to $14,225,907. I have not the returns for this February as yet, but assuming that it has been a better building month the country over, and that not only in the twenty-three cities but even making a pretty liberal allowance for the smaller towns and the villages, we put up $28,000,000—a very liberal estimate—or $1,000,000 a day in building, still, at least during the ten-day period I refer to, we burned up as much as we built and *nearly half as much again besides,* which half million, if properly expended, instead of destroyed, would have more than sufficed to have made *everything* that was built during the same period, be it theater, town hall, church, dwelling, barn or pig-sty, *absolutely fireproof*

We not only burn up millions, but, as was pointed out last month, we pay out millions more in a futile effort to recoup ourselves at least in part for the first millions wasted. It has been very difficult to get much more than the regulation insurance reports of fire insurance indemnities incurred during this ten days' period, particularly in the smaller places. In general terms, however, it would seem as if, the grand total considered, about one-third of the people carried insurance, and in most of the fires I should say that the people who were insured averaged policies of probably one-third of the actual damage done, or a trifle over that.

One notable exception to the rule, however, is Collier's, the National Weekly. The editor of that up-to-date and snappy journal has placed the fire question right up alongside of the other great questions of the day. Scarcely a week passes without some comment tending to put the matter before its readers succinctly and in such shape as to challenge action. In the issue of March 4, the editor makes graphic comment, pictures without words, as it were, four cuts showing four disastrous fires within as many days in Chicago. Further on in the same issue he makes a statement that is well worthy of repetition here:

TWO FRIGHTFUL LESSONS IN VAIN.

"The fire in the Casino Theater, New York, which would have duplicated the Iroquois disaster if it had happened two hours later, has revealed the fact that all the wrath and grief that swept over the country a year ago have been practically barren. The most stringent rules for the safety of life were adopted in New York, as in other cities, after the crime in Chicago, but hardly anything seems to have come of them. Theatrical managers have become brazen in their defiance of public sentiment. The firm that owned the show which was on the Iroquois stage at the time of the fire, as well as part of the theater itself, actually brought a libel suit against a paper that ventured to print a cartoon on the subject, and when that failed it had the paper's critic excluded from most of the theaters of New York. Another manager wrote an impudent letter to District Attorney Jerome, who had mentioned some of the deadly features of one of the manager's playhouses. The Casino was found, after the fire, to have been filled with flimsy wood and other combustible materials. Although a stringent rule was adopted last year requiring all scenery to be fireproof, Mr. Jerome asserts that there is 'practically no fireproof scenery in any city theater.' His belief, too, is that 'none of the so-called asbestos curtains in the theaters is fireproof.'

"While the Iroquois lesson has been thus disregarded on shore, the equally appalling Slocum lesson has been disregarded afloat. Not one step has been taken toward remedying the frightful conditions revealed by the destruction of the General Slocum, and later by that of the Glen Island. The House passed five bills in one day to improve inspection service and insure the presence of superficial fittings of good quality on excursion boats, but not one of them touched the *fundamental question* of the safety of the boat itself. It remains as it always has been, perfectly lawful to build and pack with human beings a boat that will flash into flame at the touch of a match."

* * *

The Brickbuilder of February, in speaking of our fire loss, says: "A country less wealthy than our own would have been bankrupt long ago with such perpetual throwing away of property. And it is hard to altogether explain, either, why such conditions exist at all, or still more, why they should be allowed to persist. . . . And the very worst of it is that in no cities are there any signs that the conditions are improving. A year ago the wise ones looked pityingly at Baltimore and declared that for its structural sins it had been visited by such a fire, but the same results could happen in anyone of the twenty or thirty large cities of this country. As our wealth has increased, the merchants, the shops, the warehouses have increased their stores more than correspondingly, so that when a fire is once started the loss may run up into millions within a few minutes. Million dollar fires are no longer infrequent. . . ."

The *New York Sun* is just beginning to awaken and asks the very pertinent question whether a city the size of New York would not find it economical to prohibit the further erection of combustible materials. (?) Why should a paper of its standing wait until this late date to ask this question? Until cities get stirred up to the proper point where they insist that nothing but absolutely fireproof construction can be used in new buildings and that the old be so hedged about, and altered and fixed up or removed, if they are beyond being put into passably decent shape to resist fire, just so long will we suffer from this awful scourge.

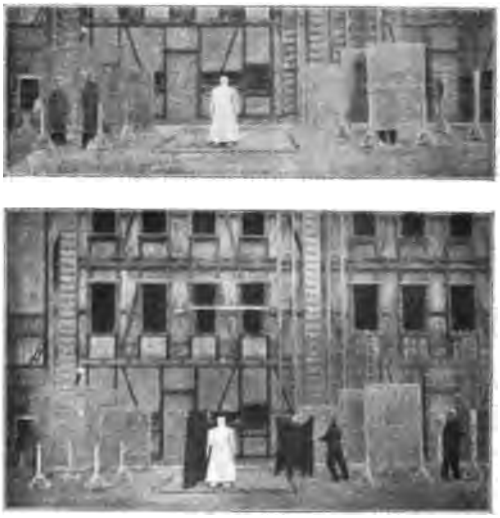
The *American Contractor* of February 25, also speaking of our great losses, says, "While the country was visited by various destructive conflagrations during the past year, that fact does not account for the greatly increased loss, and leaves us open to the rather serious reflection that we are not taking proper precautions against fire. For the most part our cities and towns are well equippel with departments and appliances to combat and overcome fire, the art of fire fighting having been decidedly developed during recent years. The fact that disastrous fires continue to occur and sweep out of existence vast quantities of property, the result of arduous and intelligent human labor, suggests that there is something defective in our plans for the prevention of fire."

The real reason is not difficult to find. The labor brought to play in constructing most buildings is not intelligent. The inception of the buildings is not intelligent, the selection of materials with which they are built is not intelligent, the manner of putting the materials together is not intelligent. There is a woeful lack of intelligence in the whole system of construction so generally in vogue. Why, even in what is supposed to be fireproof construction, where the structural parts *are* properly of steel and tile, there is but scant intelligence used in the fitting up of such buildings; wood floors, wood trimming, all manner of wooden and other inflammable stuff is scattered about in the fatuous belief that in being within a structure which is, of itself, incombustible, it becomes, through some magic or occult process, also incombustible, when as a matter of fact it seems as if every possible endeavor were made to bring everything into play that might damage the parts that are, of themselves, fireproof. Intelligence? forsooth.

BERLIN'S THEATER FIRE WATCH

It is not uncommon nowadays to hear reports of the want of training and negligence of employes to whose watchfulness is entrusted the lives of thousands of people. We also hear of the reduction of the number of firemen heretofore required by law to be in attendance at performances in theaters on account of the tearful complaints of expense by theatrical managers. These are of no avail in Germany, where they not only retain the firemen, but give them valuable instruction as to their duties and preserve strict discipline among them. The following from the *Builders' Magazine* (London) shows how this is done:

> It is a matter not generally appreciated that ever since the early 60's the Royal Police Fire Brigade of Berlin has done the duty of "fire watches" in the theaters of the Prussian capital. It is not our purpose to here comment upon the advantages or disadvantages of the "fire watch" in a theater being manned by firemen from the local professional brigade. There are certainly very distinct advantages, but at the same time there are disadvantages. Thus the responsibility of the management decreases in ratio to the increase of responsibility taken over by the public authorities in putting "fire watches" into theaters.
>
> Further, a system that would be eminently applicable in one country is not necessarily equally applicable in another, and thus what is recognized as an essential in Berlin is not necessarily either essential or politic in London.
>
> The fact remains, however, that as far back as the 60's it was the recognized thing for the "fire watch" in every theater to be manned by professional firemen, and that during the last forty years this system has been gradually developed in such a way that we to-day find that the Berlin fire brigade has an entire company of firemen, known as the sixth company, which company has been specially formed to take over "fire watch" duty in places of public entertainment. This company, which is of considerable strength and is in the special charge of two superior officers, is systematically trained to theater work. So that the men shall not become rusty in their general fire practice, the men are transformed to and removed from this company at intervals, and the company also affords certain "reliefs" for the ordinary duty men during certain hours of the day—such as the dinner hour—so that the men keep their hands well in for the ordinary routine work and ordinary fire work, although belonging to the special theater section. The total strength of the theater company comprises twelve foremen and fifty-seven firemen. The "individual watches" vary in strength from one to twelve, the latter strength being at the Royal Opera House, a building requiring exceptional precautions.
>
> Great efforts are made to keep the men on "fire watch" in good physical condition, and thus they are drilled daily and also have to do gymnasium work daily. The Berlin brigade suffers considerably from the tendency of its older and more experienced men to run to fat, and this necessarily requires very energetic handling. The special drills comprise a drill with cloths for wrapping up a human being whose clothes have caught fire, bucket drill, hydrant drill, iron-curtain drill, ventilation "flaps," "sprinkler" and fire-alarm drills, life-line work.



THEATER FIRE WATCH DRILLING AT BERLIN.
Showing use of "dummies" and other theatrical accessories.

> The illustrations which we reproduce are snapshots taken during a drill at the headquarters fire station; a dummy doll is being used, there are dummy wings, a hydrant, etc., and we see two men getting to work with cloths and two men setting to work with hydrants.
>
> We believe this illustration is quite unique in the annals of theater protection, and it may serve as a basis for the further development of the subject of "fire watches"—be they private or professional—in our theaters.

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MAY, 1905

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THE PRICE OF INCOMPETENCE AND VIOLATIONS

The use of inferior building materials has cost the country dearly in the past, and as our national fire bill mounts steadily upward it would seem as if a reaction must inevitably follow, but while the architects and builders are concerned over the employment of absolutely fireproof building material from foundation to roof, recommending its use in season and out of season, a secondary question of how the workmanship is performed and how city building ordinances are observed comes up for immediate consideration. The price of incompetence and violations of building laws is something fearful—only a little less than the fire losses. What matters it if the best fireproof material in the world is used if incompetent constructors use it ignorantly, so that the very fundamental principles of its usefulness are ignored? While city building laws are often faulty, it is nevertheless very important that they should be impartially enforced to secure even approximate security.

The building laws of many of our American cities are notoriously winked at where political pulls can influence inspection. A good many of the fire disasters and collapses of half-finished buildings are due entirely to violations of the laws or to the employment of incompetent contractors and labor. There is probably nothing which discredits the use of fireproof material so much as to have it fail at the critical moment through faulty construction. If iron and steel girders warp and twist because they are not properly protected by fireproof tile or brick, the result is laid up against the material which was supposed to protect them from excessive temperature. Faulty construction thus prejudices many against materials which have *successfully* withstood fire tests.

The movement in New York to require by law that architects shall supervise the construction of buildings for which they furnish the plans is in the right direction, and it has the support of the best builders and contractors. For his own reputation an architect of standing should desire this. Masonry and steel construction contractors are not registered in New York, and frequently those who work under this name are absolutely incompetent to supervise the erection of first-class buildings or to carry out successfully the plans of the architect.

The division of the responsibility thus makes it possible for flagrant violations to appear.

Another point which needs emphasizing is the lack of co-operation that is frequently noticeable between the different trades. One set of workmen will often destroy a good deal of the work of another in order to make their labors lighter. Electrical engineers will frequently tear down tiles and bricks to put their wire and cables in, and unless the tile workers follow again after them patch work results, and a possible avenue of fire danger is left open. On the other hand, electrical engineers complain that their perfect installation of wires and switchboards is sometimes injured by workmen who subsequently follow them. Not understanding the needs of perfect electrical installation, a tile or metal worker may injure the cable conduits or lead cables so that danger from fire is introduced.

It is only by the co-operation and coordination of these different classes of workmen under a competent supervising architect that all dangers and risks can be entirely eliminated. The construction of a modern fireproof city building should progress by logical steps, each one leading up to the other, and the whole blended together in harmony. This is manifestly impossible unless one master mind controls all the different steps and supervises the completion according to the first plans.

Where the construction of modern buildings is left to the contractors or incompetent, unregistered builders, the architect's plans may be carried out only in part, and, not supervising the work personally or depending upon his trustworthy assistants, the original designer leaves his reputation at stake. There is no absolute assurance that the class of building materials called for in his specifications are being used, or if used he has no direct knowledge of whether the work is being done in a satisfactory way. This practically throws the whole question of proper building materials and workmanship upon the honesty and competency of the city building inspectors. As the latter are too often appointed because of political favoritism rather than for any special skill, it is manifestly impossible to guarantee a uniform grade of work. The use of inferior building material thus comes in as a vital point of weakness. In the past investigation in New York, a number of building operations have been held up since the collapse of the Bronx buildings because of inferior grades of fireproof materials. One of the most important of these recent occurrences was the reported misuse of fireproof lumber (wood) to be used in the Trinity building, a twenty-two story structure on lower Broadway. There were some 300,000 feet of this so-called fireproof lumber which the district attorney reported had proved to be only 25 per cent fireproof according to the New York Board of Fire Underwriters' tests.

The question at issue is whether an architect who does not supervise the erection of his own building can secure results which he should desire to represent the standard of his work. Unless associated with structural engineers whom he can trust, and some contractor of equal probity of character, he must depend upon outsiders whose responsibilities are often limited to separate parts of the whole work. With such divided responsibility it is open to doubt whether perfect modern fireproof buildings of the highest class can be constructed so that every detail is known to be performed in a workmanlike way.

New York's building laws are recognized by all reputable architects and builders to be faulty and totally inadequate to the building needs of the day. They are out of date and need thorough revision by experts. It is to be hoped that a commission may result from the present deplorable conditions, and that competent laws may in time be framed to keep pace with the modern developments of building construction. The control of the building operations from the beginning to the end must come under the supervision of trained experts, whose reputation will be seriously injured when flagrant oversight or fraud is permitted to creep in.

ANOTHER LOST OPPORTUNITY AT BALTIMORE

Baltimore has encountered another crisis, and, as may be supposed, it has surrendered to the inevitable. It is building a new structure called the Eastern Female High School at North avenue and Broadway, which is under contract to be erected for a total sum of $311,000, to accommodate 1,000 girl pupils. It seems that after it had been put under contract someone discovered that it was not to be a fireproof building. To state the matter fairly, the specifications only provided for the fireproofing of the corridors and staircases and the floor directly above the heating apparatus. But it appears that these were requirements of the building ordinances of the city which had to be followed. The proper officials having neglected to provide for the safety of the pupils in its charge, as soon as this almost criminal negligence was discovered, citizens in various parts of the city, according to the Baltimore *Building News,* started an agitation in favor of making the building completely fireproof, which resulted in the calling together of a committee for the discussion of plans and for recommendations to the boards of estimate and awards. Estimates were procured, showing that the building could be made fireproof for an additional cost of $35,000, which would be an addition of only 11 per cent to the cost, and is near the lowest estimate ever made by FIREPROOF MAGAZINE of the extra cost of fireproofing. We have no knowledge, however, of what system or material was proposed to be used. The people, however, seemed to be greatly in earnest, and the *Baltimore American* advocated the change editorially. An earnest appeal also appeared in the same paper signed "Parent." It is also stated that the architectural committee of the school board, Mayor Timanus, the building inspector and the consulting architects, all agreed that it would be desirable to make the building fireproof, and an ordinance was introduced in the city council making the required additional appropriation.

But now comes City Solicitor Bruce to proclaim the majesty of the law. He says that the change cannot be made, as the contract is drawn, and yet the contract has the usual provision for changes. But this

Dogberry is inexorable and Baltimore is as helpless in getting a fireproof high school as it was in stopping the fire of February 22, 1904. So the project has been abandoned, and the people of Baltimore must watch the erection of a firetrap in which 1,000 of its innocents are to be housed, without power to prevent the crime.

WILLIAM Le BARON JENNEY

After a long and honorable career in the practice of architecture in Chicago Mr. W. LeB. Jenney has retired from active practice. Owing to ill health he has spent the past winter in California and has concluded to make his permanent residence in Los Angeles. Mr. Jenney retires with an international reputation. He was educated in Paris in architecture and engineering, and returned to this country prior to the breaking out of the Civil War. Upon enlistment he was assigned to the engineer corps under General Grant, and was mustered out as brevet major, chief of engineers on the staff of General Sherman. He came to Chicago and began the practice of architecture in 1867. From the start his work was recognized and it has left its impress upon the rapid growth of the city.

Mr. Jenney was to the West in construction what the late Richard M. Hunt was to the East in design, a man of reason and ideas, and fearless to exploit them. Many of the leading architects of Chicago were at one time in his office, notably, Messrs. D. H. Burnham, Louis H. Sullivan, I. K. Pond, Howard V. D. Shaw, William Holabird, Martin Roche, Jas. G. Rogers, N. S. Patton, A. H. Granger, and others. He will now take his well-earned rest from his successful and busy career.

The business will be carried on under the firm name of Jenney, Mundie & Jensen, by Mr. Mundie and Mr. Jensen, who have been with Mr. Jenney for the past twenty years.

OUR INTELLIGENCE SERVICE

We desire to call the attention of our readers to the fact that we are especially well equipped to furnish information, either through our editorial or business departments, on any question bearing upon protection from fire loss and kindred subjects.

Many of our readers frequently request information upon some point which we can readily furnish them, and we feel that many more would do so if they realized that we are capable and glad to serve them.

If readers do not find in our editorial or advertising pages certain information they may want, our intelligence department is at their service.

All communications are handled by direct correspondence and without delay.

ABOUT ENGAGING AN ARCHITECT

BY THE EDITOR.

THE investor who has to do with the erection of a fireproof building, whether he has had previous experience or not, must first employ an architect. If he has before had successful experience with an architect he should certainly return to him for a second undertaking. In most cases of the erection of large fireproof buildings such as office buildings, warehouses, large banks, and buildings of a similar character, the owner generally goes to an architect of large experience. The names of the leading men in this profession in all large cities are well known. He knows that if he approaches them he will be expected to pay the usual fees and will get good services. He states his problem, and has little to say about the construction of the building. He leaves that to the architect, having decided only that his building shall be fireproof, that is to say, fireproof in its construction.

In what follows we do not refer to the finish or elaboration of such a building, but only to construction and fireproofing. Such an architect will, in almost every instance, advise his client to use steel as far as possible for the general structure of the building, and some reliable fireproofing material such as fire brick, hollow porous terra cotta, or probably solid porous terra cotta, as well for the protection from fire of the steel constructive members as for the intermediate lighter forms of construction, such as the floors, partitions and roof, all of which will be executed according to well-known and well-tried methods. He has very plain sailing in such a case. All the parties to the transaction recognize that steel is the essential feature in the construction of a modern fireproof building of the best class. It stands as the bones of the human body. It is used as economically as possible according to the demonstrable modern science of architectural engineering, having been planned by a structural engineer called in by the architect. The protection to this steel skeleton is made of the necessary thickness to resist the most intense fire that can be generated in a fireproof building. But this is not all that is necessary for this purpose. It must be so secured in place that it will not be displaced or disintegrated through the many contingencies common to a severe fire within the building. What is known as the "finish," both for the exterior and interior, will be used as a covering of the fireproof material used. The outside will probably be in some form of terra cotta, used with or without brick. The interior may be of various materials. The work is carried to a successful conclusion, and the result is generally satisfactory.

ANOTHER CASE IN WHICH MISTAKES MAY ENSUE.

In another case the owner may not heretofore have employed an architect. He may be one of a building committee for a public building in which a competition has been instituted, or he may have had some very responsible architect recommended to him by a friend. Possibly the recommendation may have been on account of the success of this architect in the erection of his dwelling house, or some building in which the artistic features of the design have been the predominating attractions. The architect may have had more or less experience with steel construction, and may be fully aware of the necessity for giving great care to the designing and execution of the same, and the employment of experts in the preparation of the plan for this part of the construction; or perhaps he does not have a decided opinion as to the necessity for any special kind of fireproofing. He has given very little attention to it heretofore. He is not very well informed as to the expense of various methods of fireproofing. He may think that all that is necessary is that the material should be incombustible. The owner may not have had experience in previously directing the construction of such buildings and has a mind free and open to suggestions. He talks with his friends about what he proposes to do. His approaching work comes to the knowledge of interested parties who are seeking to introduce their own special methods of construction. They seek to enlighten him upon these materials, and some of them are most importunate in their efforts to secure his patronage. If what they present seems best he brings these matters to the attention of the architect. The architect then reveals to him that he is undecided himself as to what is best to do, and as a result a series of estimates are made and considered, many of which contain very enticing propositions for saving money. New constructions are suggested even to the extent of doing away with the steel skeleton of the building which had been originally contemplated, or doing away with the intermediate steel floor beams and the substitution of other constructive methods. In such cases the owner and the architect, both of whose intentions are of the very best, become confused by the ramification of these various propositions to such an extent that in the end they probably decide upon some method of building which to them appears not only economical but safe. The most flattering proposition and the one most likely to be accepted by those who are inexperienced in such an undertaking, is to do away with as large a part as possible of the steel construction. If this is the case the fatal step has been taken, one which thereafter it will be impossible to retrace, and the difficulties which ensue when inexperienced persons undertake to do something of which they are not fully informed are likely to be encountered. It is not to be assumed that the building will be a failure. It may possibly be cheaper than if the standard and well-tried methods of construction had been used, but if at any future time it shall be found that the method is defective, it will be beyond correction or repair. If it had been constructed with the proper skeleton of steel the inexperienced architect would have been obliged to employ an expert constructor in his planning, and probably one of the great economies which had been suggested by those having what are claimed to be new and improved methods was that the architect did not require the services of an expert engineer if he would adopt one of the new systems. This is one of the economies always set forth by those who have new methods to introduce, and they often appeal to the architect, who has made a bad bargain with the owner for his services. But they are the kind of economy which practically throws the control of the whole work into the hands of the contractor. He does his own constructing and induces the owner and architect to accept it. He regulates the kind and quality of material that he has to use, and the only security they have for the successful execution of the works rests in the so-called guarantee which he gives. Once having accepted such a guarantee, whose value depends entirely upon his own financial responsibility, they are powerless to criticize or question the work which he does.

Now all this new work may be composed of various kinds of reinforced concrete, and it may be good, hard concrete, or it may be poor and cheap cinders concrete. It does not matter which, for the saving in cost has been in getting rid of the steel and in the introduction of other cheap materials at what is really a very high price for them.

THE UNWISDOM OF CUTTING FEES BY AN ARCHITECT.

Or perhaps the owner, not being aware of the amount of work to be necessarily done by his architect to insure the best results, has driven a hard bargain with the architect—mistake number one—and his architect, not unlike many of his kind—though he be a reliable and conscientious man—fearful of competition by unscrupulous members of his profession, has made a concession from his established fee. In such a case, even though steel construction has been decided upon, there is too great a temptation to the architect to dispense with expert assistance for the sake of economy. This has too often been the case, and the results have been unfortunate, not to say dangerous; detrimental to the interests of the owner and disastrous to the reputation of the architect.

A GOOD ARCHITECT WILL SEE THAT THE STRUCTURAL BONES ARE IN THE BUILDING.

The moral of this story is, of course, that the prospective owner of the large fireproof building should exercise as much care in selecting his architect and in seeing that the architect employs a thorough engineer, in order that the backbone of his building may give all the service that it would be called upon for, as he would exercise in selecting a surgeon in carrying out an operation on his body. This does not mean that he should always employ one of the few architects in large practice who have had to do with the many large fireproof buildings that have been successfully erected. It is far from our purpose to suggest that an architect should be employed only because of his large experience. There are many whose experience is smaller but whose skill is as great.

THE ARCHITECT SHOULD BE UNTRAMMELED.

In saying that the owner should exercise care in the selection of his architect, we might add that after so doing, even though his architect is not one of the few favored by good fortune, he should not seek to control his judgment and should not interfere with his efforts to investigate and find out what is the best system of construction and fireproofing to follow. It is this habit which inexperienced owners have of listening to everyone who comes along, whether they are interested or disinterested parties, when they have to do with the erection of a building, that is the cause of nearly all the blunders and mistakes that have been made in the attempt to erect modern fireproof buildings. The owner should place the full responsibility upon the architect, and if he does he may be sure that in the end he will get the best results. No right-minded architect will shirk this responsibility, but if the owner is only seeking a makeshift and trying to get something whose chief merit is cheapness, he deserves to have all the trouble and sorrow that such an undertaking will utlimately bring to him.

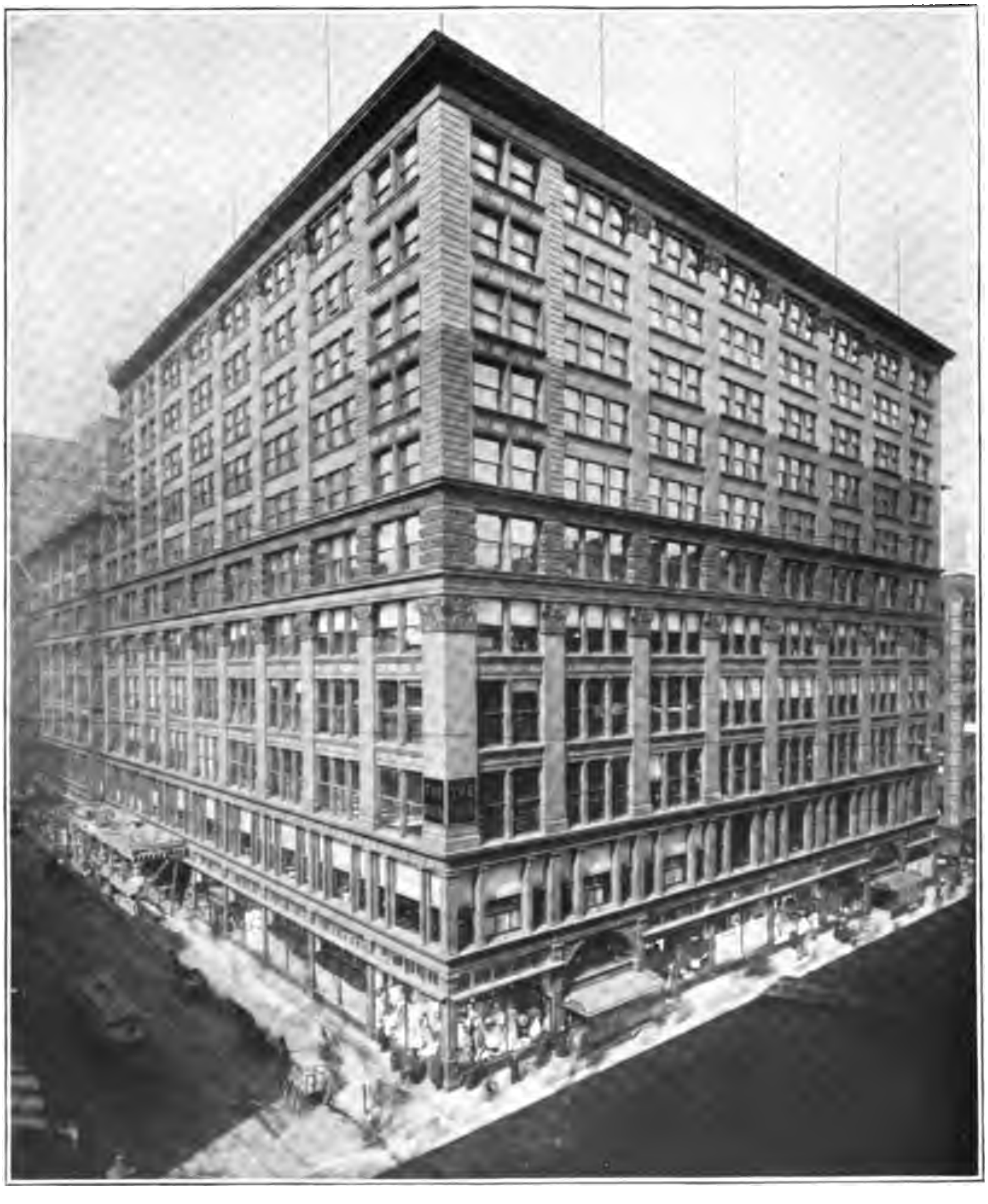


FIGURE 1.
THE FAIR BUILDING, CHICAGO.
Showing the Enlargement of the East Half Completed; Jenney, Mundie & Jensen, Architects.

ENLARGING THE FAIR BUILDING, CHICAGO

BY ELMER C. JENSEN.

THAT the steel skeleton fireproof building is flexible has again been demonstrated, the word "flexible" in this instance meaning that the building can be readily and easily enlarged and altered. The Fair building, occupying half of the block between State, Dearborn, Adams and Monroe streets, has been recently enlarged by the addition of two stories, which were constructed without in any way interfering with the business of the store or exposing the building to damage by storms, although the work was carried on in Chicago's worst building seasons, i. e., winter and spring.

The original designs for this building contemplated 16 stories above the street level, excepting on a small part of the lot which had been leased.

From the very beginning the Fair has enjoyed what may be called a career of expansion, demanding flexible buildings. From a small store it has gradually grown to be one of the largest and most successful in the country. The property was originally covered with a large number of small buildings from two to six stories in height, each occupying a small piece of ground. As the business increased adjoining buildings were occupied, openings were cut through walls and difference in floor levels made up with steps or inclines. When the present building was determined upon the owners concluded that they could not afford to vacate but a small portion of their old premises, and that only for a short time, hence it was determined to build in sections, and that as rapidly as possible. It was this very condition that proved the steel skeleton and hollow tile construction flexible. The floating or spread foundation and basement columns were completed under the old buildings, which were then vacated and three or four stories of the new building were then completed and occupied as salesrooms and the upper stories and other sections hurriedly built and completed. Each completed tile arch floor served as a roof for the lower stories, and as soon as one story was completed it was occupied.

The following list will show how many changes have occurred since the commencement of the present building:

West half of present building constructed, 1891.

East half of present building constructed, 1896-97.

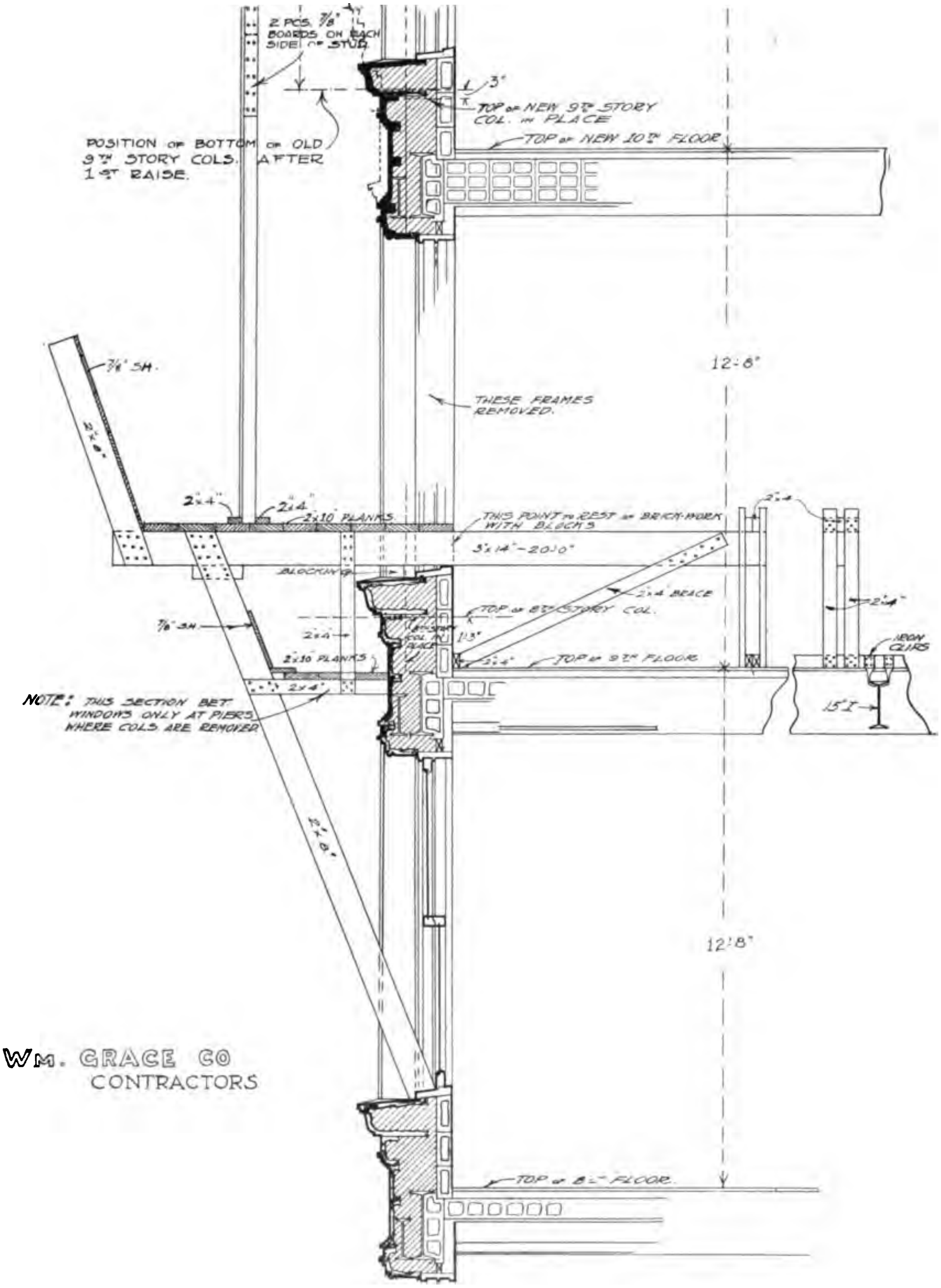
Automatic sprinkler system installed, 1897.

Four new elevators installed, 1901.

Package conveyor installed, 1903.

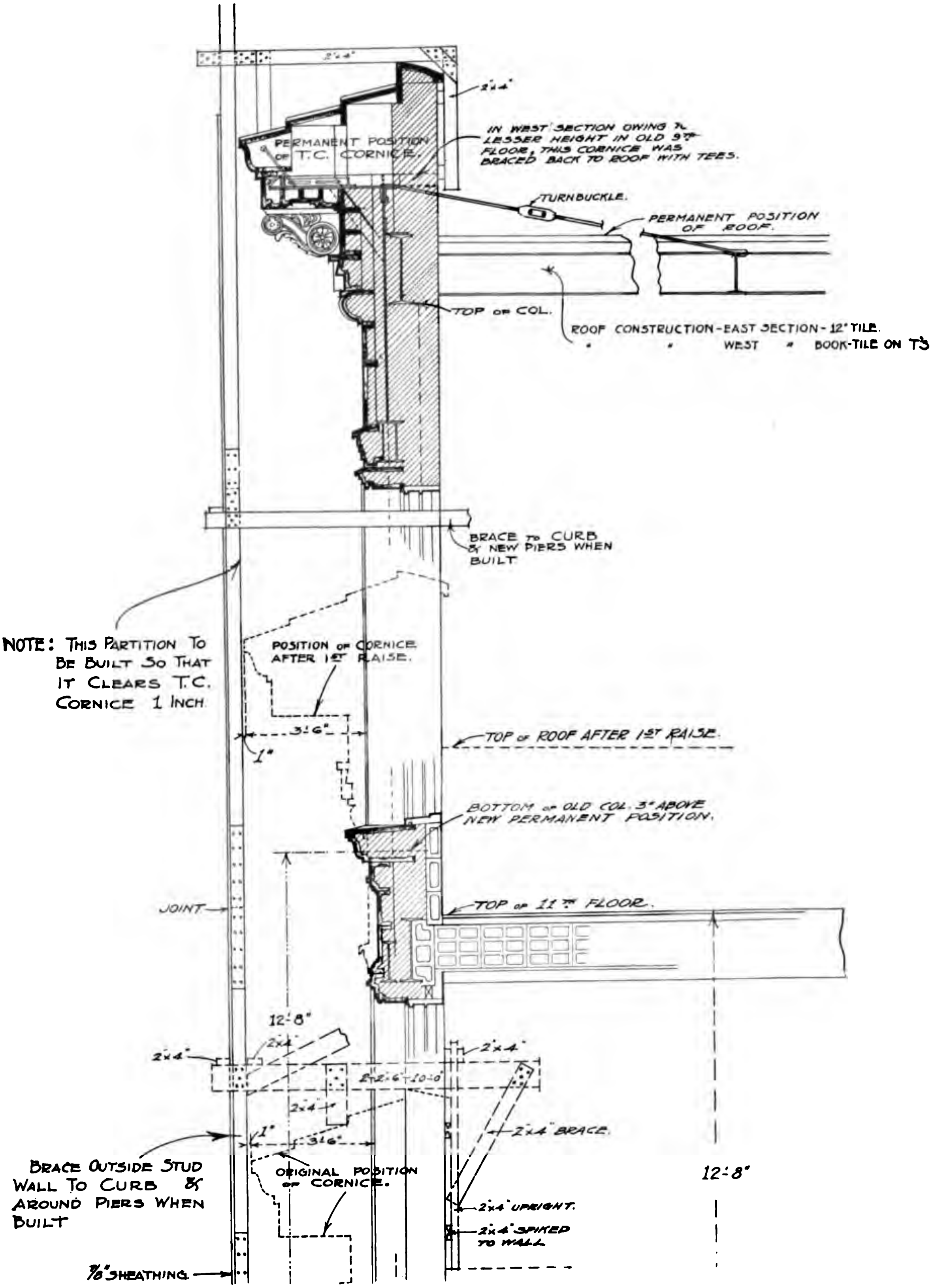
Tenth and eleventh stories added, 1905.

All of these operations required changes in the structure, which were made simple owing to the steel skeleton construction. The last operation was probably the most interesting because of the novelty of raising a roof of such large area and because the entire new space acquired was constantly kept inclosed. with a temporary inclosure. The raising of the roof was accomplished in two sections, partly because



SECTION BETW. COLS. 101-118 & 172-173.
SCALE: 1" = ONE FOOT.

BARRICADE FOR FAIR BVILDING – CHICAGO.
LOWER SECTION.


2"x4"
2"x4"
PERMANENT POSITION OF T.C. CORNICE.
IN WEST SECTION OWING TO LESSER HEIGHT IN OLD 9TH FLOOR, THIS CORNICE WAS BRACED BACK TO ROOF WITH TEES.
TURNBUCKLE.
PERMANENT POSITION OF ROOF.
TOP OF COL.
ROOF CONSTRUCTION - EAST SECTION - 12" TILE.
" " WEST " BOOK-TILE ON T'S
BRACE TO CURB & NEW PIERS WHEN BUILT
NOTE: THIS PARTITION TO BE BUILT SO THAT IT CLEARS T.C. CORNICE 1 INCH.
POSITION OF CORNICE AFTER 1ST RAISE.
3'-6"
1"
TOP OF ROOF AFTER 1ST RAISE.
BOTTOM OF OLD COL. 3" ABOVE NEW PERMANENT POSITION.
JOINT
TOP OF 11TH FLOOR.
12'-8"
2"x4"
2"x4"
2"x4"
2-2"x6"-10'-0"
2"x4"
2"x4" BRACE.
1"
3'-6"
BRACE OUTSIDE STUD WALL TO CURB & AROUND PIERS WHEN BUILT
ORIGINAL POSITION OF CORNICE.
12'-8"
2"x4" UPRIGHT.
2"x4" SPIKED TO WALL
7/8" SHEATHING.

BARRICADE—UPPER SECTION.

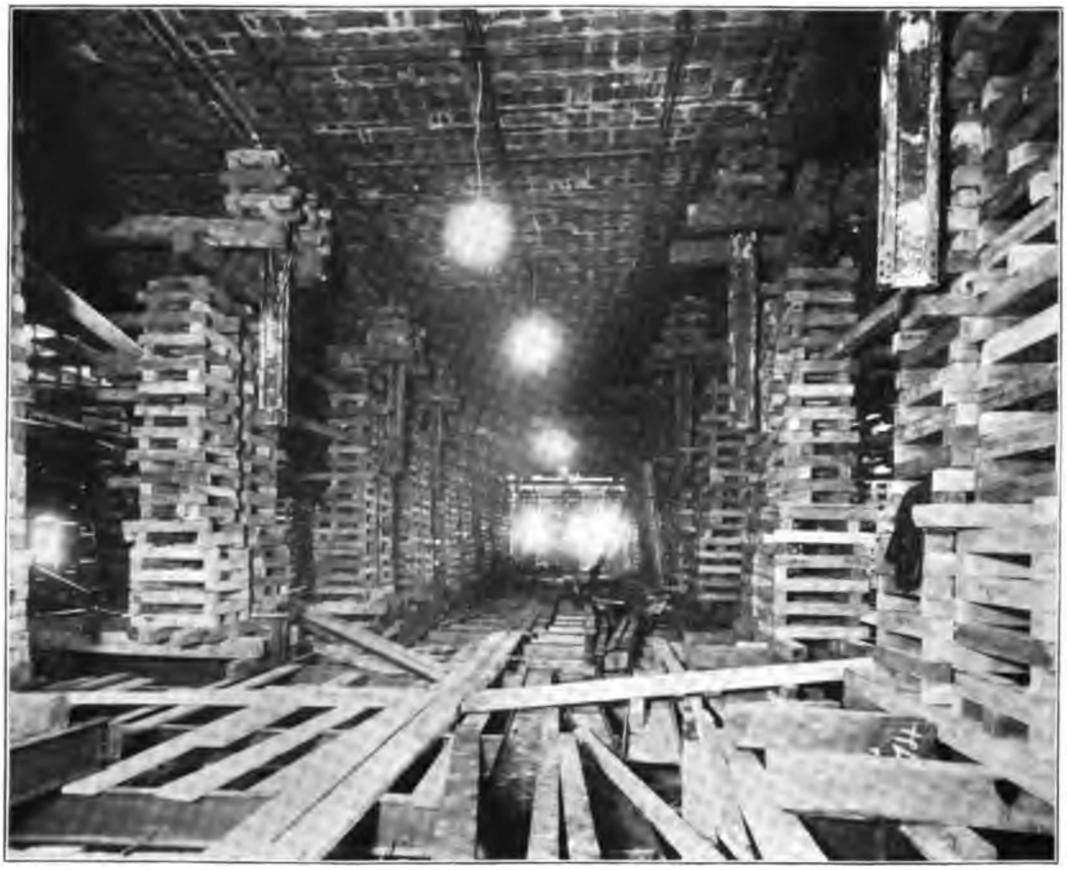


FIGURE 2.
INTERIOR OF FAIR BUILDING DURING ENLARGEMENT.

all of the space could not be occupied by the workmen at one time, and partly because it was thought better time could be made if the work was done in sections. The roof was disconnected at the center in a north and south direction and the east half raised first. The drums and cribs (built up with house-raising blocks) were set at the sides of the columns and the weight distributed over the floor beams and girders by means of wood and steel beams. When the roof had been raised sufficiently to allow the ninth story columns and the tenth story floor beams and girders to be set in place, the cribs and drums were set upon these beams and girders and the raising continued. The loads were distributed according to the strength of the connections at the ninth floor girders. On the street sides blocking and cribs were used in the eighth story to distribute some of the additional load of the terra cotta cornice upon the eighth floor steel. The exterior walls in the ninth story were removed to allow of the steel columns being disconnected and raised with the roof. Wood lookouts were built out from the ninth floor—a wood inclosure built out over the street—and the sides were extended as the roof was raised. The vertical members of this inclosure extended above the top of the cornice and were anchored back by means of wood ties with a loop around each upright, allowing the tie to raise and still act as an anchor. The terra cotta cornice, which weights 2,500 pounds per lineal foot, was raised intact, although it was the original

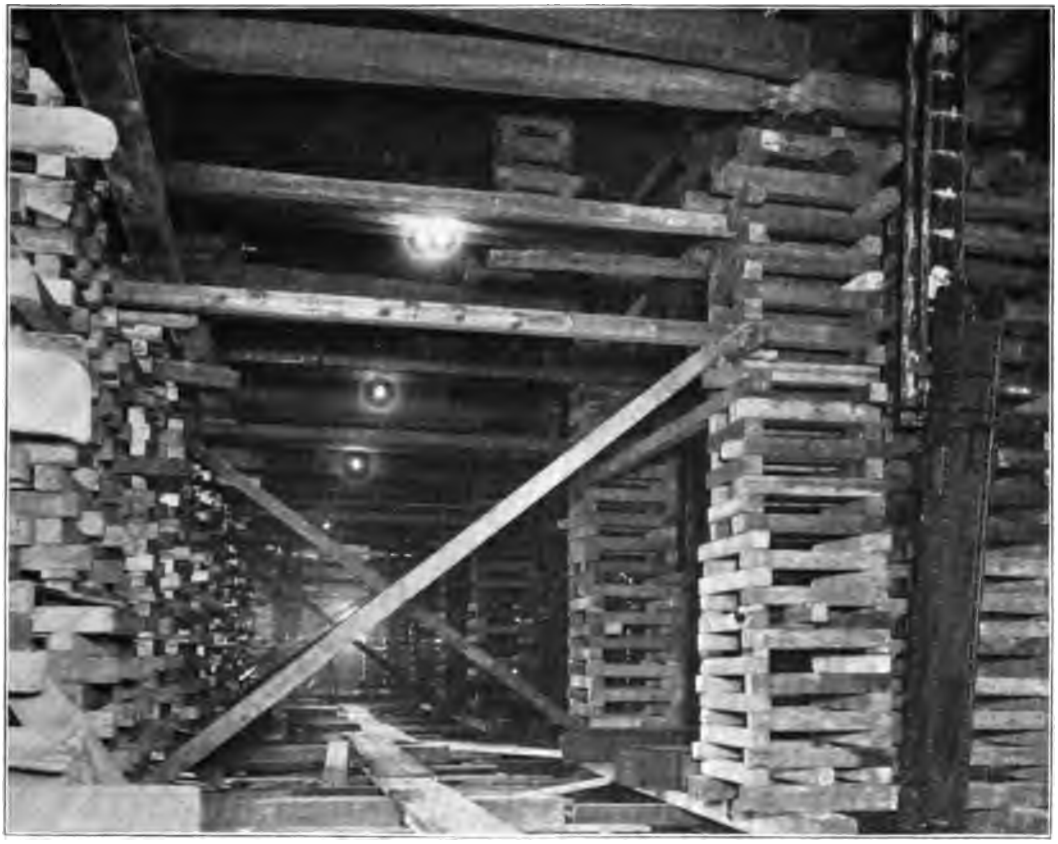


FIGURE 3.
INTERIOR OF FAIR BUILDING DURING ENLARGEMENT.

intention to take it down and reset it in its permanent position. The old brick and terra cotta was used in the new work except where it had been damaged in the removal.

The walls of the interior courts were inclosed with wood, same as the street and alley walls, and all elevators and stairs protected with plank barricades and coverings.

The west half was handled in a similar manner, except that the old top story columns were left attached to and raised with the roof.

The following figures will show the weight raised and the time used in raising:

EAST HALF.

Size, 190x195 feet; court, 47x62 feet.

Weight of roof, 75 pounds per square foot.

Weight of cornice, 2,500 pounds per lineal foot.

Total weight of roof, 1,800 tons.

Number of cribs, 192; screws, 591.

Additional drums in eighth story for outside walls, 48.

Scaffolding commenced January 10.

Raising commenced January 21.

Ready for ninth story columns and tenth story steel January 31.

Started raising for next story February 13.

Roof in permanent position February 21.

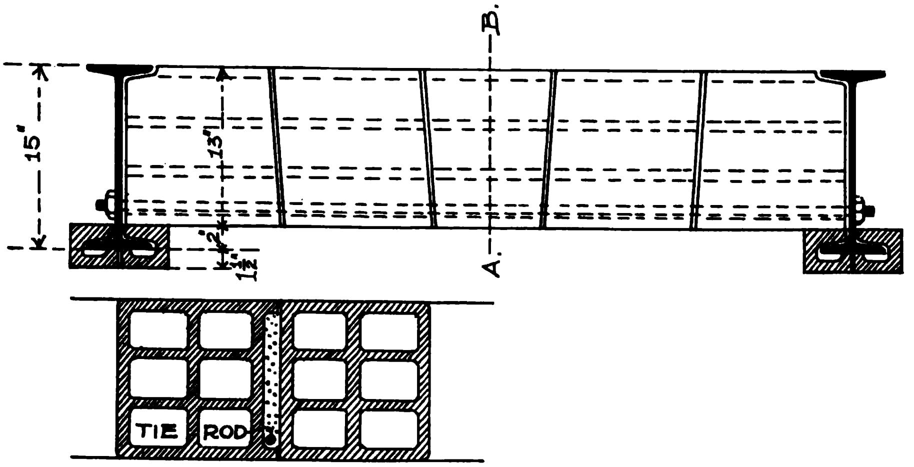
Commenced removal of cribs and setting of tile arches February 23.

Commenced removal of inclosure March 12.

WEST HALF.

Size, 190x165 feet; court, 70x55 feet.

Weight of roof, 35 pounds per square foot.



SECTION A-B.

DETAIL OF FIREPROOF CONSTRUCTION
FAIR BUILDING.

Weight of cornice, 2,500 pounds per lineal foot.

Total weight of roof, 1,000 tons.

Number of cribs, 189; screws, 535.

Additional drums in eighth story for outside walls, 32.

Commenced setting cribs February 28.

Commenced raising March 11.

Ready for ninth story cribs and tenth story steel March 20.

Started raising for next story March 29.

Roof in permanent position and commenced setting balance of steel April 5.

Material was hoisted at one point on Adams street and from an overhead platform in the alley and was let down through an opening in the roof.

It was found necessary to use considerable care and ingenuity to carry on the work of raising on exactly perpendicular lines, and in order to be able to determine how the work progressed a number of plumblines were kept suspended and the variation noted at intervals.

All of the old steel that was uncovered was found practically free from rust.

The general contractors were the Wm. Grace Company, who engaged L. P. Friestedt Company for the raising and shoring. The architects were Jenney, Mundie & Jensen. The sectional drawings show the method of raising.

Illustration No. 1 shows a view of the building taken from the corner of State and Adams streets. The difference in color clearly indicates the old material that was left in place and the new work that was added.

The cornice and frieze were lifted bodily. The large pilaster caps were taken from the old work and reset. This picture was taken immediately after the outside scaffolding for the east section was removed and shows the scaffolding and inclosure for the west section at the time the roof of the west section had been raised about 12 feet.

Illustration No. 2 shows a view of the interior of the east section at the time when the roof had been raised to within 3 feet of its permanent location. It shows the original ninth story columns suspended from the roof and also illustrates how the cribbing was distributed around the columns and on the steel of the new tenth floor.

Illustration No. 3 is an interior view in the east section and shows how the cribbing was distributed around the columns and the means of bracing and tying the cribbing. It also shows a new column set in place at an angle ready to slip in under the old column when it reaches the full height.

WIND EFFECTS IN HIGH BUILDINGS

BY W. I. PARRY.

IF there is such a thing as a positively unknown quantity in building construction, certainly the wind effect as an actuality well deserves this name. The exact nature and extent of wind effect seems to belong to that category classified by Lord Dundreary as "Things that no fellow can find out." In making this statement, it is not intended for a moment to approach the heresy that there is no effect, but simply to imply that positive knowledge is lacking as to whether the wind acts by direct pressure against the side of the building or is the effect of a vacuum created by the drawing of the air around and above the building. This last assumption is based upon considering the wind acting like a rope extended over a large surface and rising and falling over hills and valleys made by the buildings and streets in a city. This "rope" is drawn over these elevations and depressions from the vacuum point which produces the readily moving current of air.

This seems to be nearer the correct assumption, for wind is not pushed, but is pulled like a rope and, in consequence, it would be drawn across the ragged surface of the sky or roof line of a city. A familiar example which tends to prove this assumption is the well-known fact that, while the current of air at the base of a high cliff may be almost imperceptible, a strong wind will be felt at the top. It is also exemplified by the upward tendency of a hat or piece of paper in the immediate vicinity of a high building.

On account of the vagueness of our knowledge of the real action, the theoretical design for wind effect is based upon the worst imaginable conditions, which, of course, is the direct pressure on the surface of the building. This is usually taken as a force equivalent to about thirty pounds to the square foot of surface and, after theorizing on this line and assuming such conditions, bracing is designed and located to take care of the stresses due to such pressure.

Unfortunately, like many beautiful theories, the resultant idea can seldom be consistently carried out. In designing the bracing, mere arbitrary points must be selected which are determined entirely by the architect's limitations. The many restrictions make it impossible to carry out the theory and vitiate any absolutely consistent design. There are, of course, some few individual cases where a consistent method of bracing is used, but these may be safely called rare exceptions.

It will be readily appreciated that where the lot area is in proportion to the height of the building it is questionable whether any special wind bracing, other than good strong connections and columns and girders sufficient to all the loads to be carried, is required, but where the building is excessively narrow in relation to its height, as some buildings are, the ghost will not down. Even in this latter case, however, it is seldom that an architect or the economical use of a building permit will provide for a theoretically correct system of wind bracing based upon the worst possible conditions that are generally assumed.

The result of all these actual practical considerations makes the argument for the standard type of steel cage or skeleton construction, where a known and uniform strength is produced by the agency of strong members and well-riveted connections, and strengthens the claims of this type to superiority over the concrete structures which have become such a fad in the neighborhood of Cincinnati. In the concrete construction we are face to face with the element of doubt as to the homogeneity of the concrete and the corollary of this doubt, which is the uncertainty of its monolithic charcater on which its theoretical strength is mainly based. In consequence we cannot always absolutely locate the members intended to take care of the strains. In the steel frame structure, on the other hand, we have fundamentally positive knowledge of the floor beams spaced at known intervals, with the certainty of their carrying capacity and bracing quality. To these are riveted connections designed upon the same basis, next the girder into which these joist beams frame and, finally, the columns with their connections, making a consistent frame work, each member of which has an absolute and definite strength and purpose.

From all the foregoing it seems that, with the limitations upon a theoretically consistent system of wind bracing, the best way in designing is to work upon the assumption of a thoroughly strong riveted up-frame figured for full loads throughout. This applies particularly to columns in the calculation of which the practice of figuring reduced live loads is sometimes used, a practice which appears to the writer as reprehensible, attempting as it does to save at the wrong place, in consideration of all the different contingencies which enter into building construction. The columns should be figured for the full loads, live and dead, and made even heavier than the conditions might seem to warrant, and, as they are the main agents for stability, they will in the majority of cases meet the unknown or unconsidered conditions so likely to arise. Examples of these unforeseen conditions are excessive eccentric loading not contemplated in the original conception or design; strains during the process of erection occasioned by cranes and stays; additional loading added, due to changes after the construction has begun, such as shifting the position of tanks or adding heavy machinery; and last but not least, the possibility of adding additional stories long after the completion and use of the building, when the figures of the original calculation have been lost or forgotten by the architect, if he is still alive.

Another element of strength in the standard type of construction is that the girders and beams acting as braces throughout the building make toward homogeneity, particularly where the outside wall girder at each floor level is carried around the outside of all wall columns and acts at each floor like the hoop of a barrel or tank binding and bracing the cage; then the interior girders acting as horizontal columns or struts as well as mere carriers of loads, and finally the beams bracing the girders and columns and still further completing the cage or frame idea.

In this connection it is always well to remember that where these floor or joist beams are spaced at intervals of about five or six feet they insure the carrying of the floor and its load independent of whatever element of strength the floor arches may add or give. For, as a matter of fact, it is questionable, when beams are placed as close together as this, whether the floor arches really ever receive the full load for which they are intended, inasmuch as it is so diffused by the floor itself, the sleepers or nailing strips and the concrete filling above the arches, that the load, or at least a large part of it, reaches the beam without affecting to its full extent the floor arches. This certainly answers the objection often urged against terra cotta arches, viz., their possible hasty and careless placing and their consequent insecurity.

So, given a theoretically consistent design with the loads to be carried, including always the greatest possible live with the positively known dead loads, sufficient connections and rivets, and the result in almost all cases is a frame that when loaded with its walls, partitions and floor arches, is capable of resisting the wind stress that will reach it, particularly if the building is in a city where it is likely that the direction of the wind conforms to the sky line of the buildings.

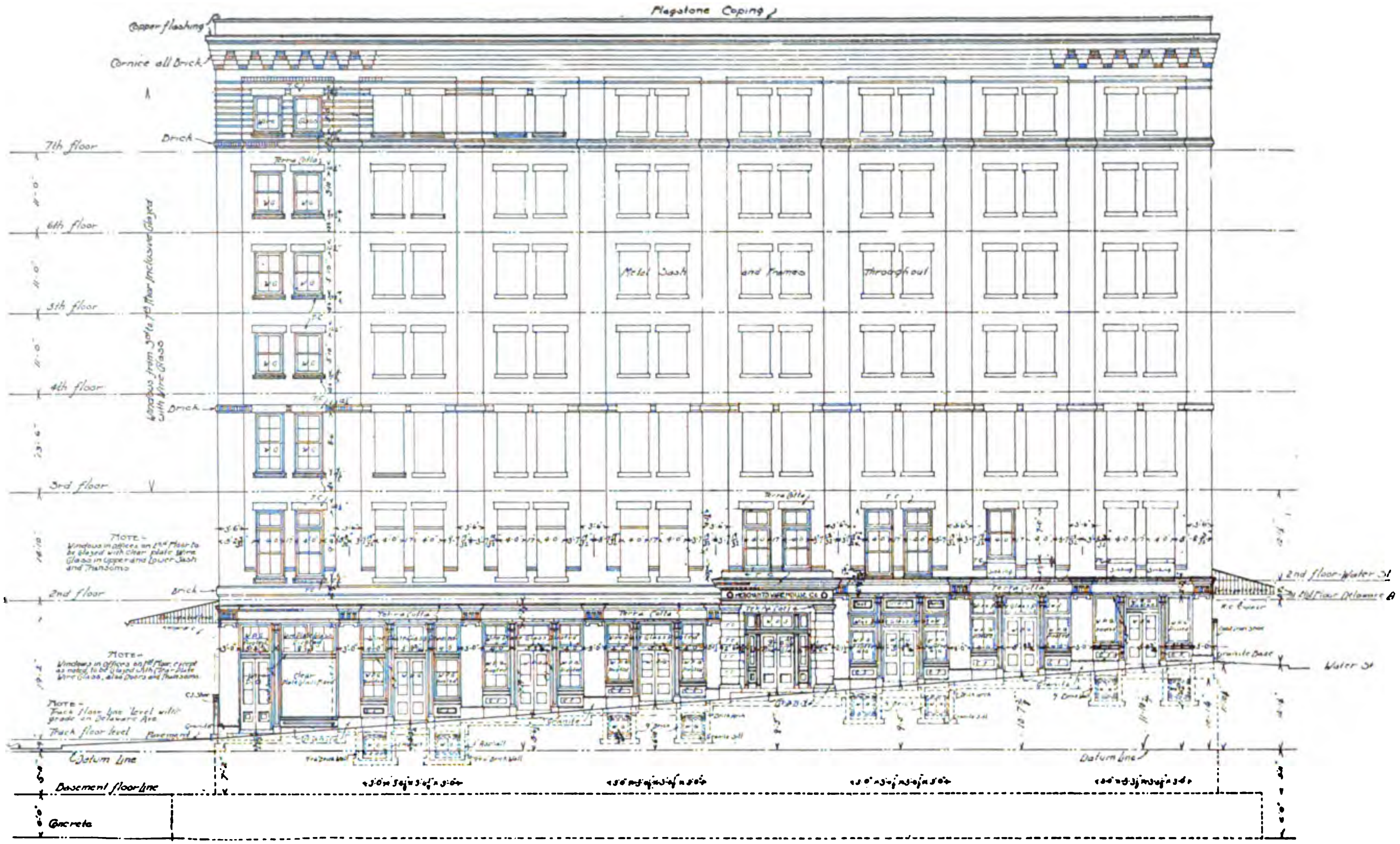
Nothing in this article is intended to convey the idea that wind considerations are a negligible quantity, but each individual case should be taken up on its merits and carefully considered in its particular relations as to location, dimensions and existing conditions, using bracing for wind wherever it is shown to be necessary and arranging the design of the framework accordingly. The intention is simply to show that where the conditions prevent the consistent theoretical treatment of this force the issue is infinitely better met by the standard steel frame of full strength than by any of the unknown and indefinite constructions of which the concrete method is a frequent example.

THE NATIONAL BOARD CONTRACTS ITS INVESTIGATIONS

In our issue for April we assisted, in good faith, to give publicity to the circular of the National Board of Fire Underwriters, giving full particulars of the organization of the "Committee of Twenty" and its purposes. We quoted some of its passages, showing an earnest desire on the part of the board to conduct investigations and publish results calculated to furnish information which would lead to the *prevention* of conflagrations and other fire losses. As efforts for that kind of initial fire prevention which consists of better methods of construction of buildings have been rare on the part of underwriters, we hailed the announcement of the Board as a new departure, in line with the purposes of this magazine. Fire underwriters have heretofore preferred to let the public alone in such matters, deeming it none of their business. They have accepted the risks that people have offered them, and rated their premiums accordingly, and when conflagrations have occurred have raised the rates on future insurers to meet the emergency.

From indications lately observed, some of the largest companies which were expected to contribute to the large expense of this new undertaking seem to have fallen back to their old way of thinking. To use a hackneyed but trite expression, they do not seem to think that "the game is worth the candle." *The Chronicle* for April 26 says that it does not look as if, at the next annual meeting of the Board, the proposed contribution of the companies of $150,000 for the yearly expense of the committee would be forthcoming.

The annual meeting has been held, and the reports in the newspapers state that a lively contest took place over the appropriation for the present year. The Home Insurance Company of New York, through the chairman of its board of directors, John H. Washburn, protested against the expense in his annual address as president of the National Board. Even though the appropriation was reduced to $104,000, Vice-President Correa of the Home served notice on the board that it would not pay its proportion, even if it were forced to withdraw from the board. The reduced appropriation was, however, voted, but with the condition that the work would be so arranged that all important matters would be completed by the close of the next year, when the committee could be retired.


Flagstone Coping
Copper flashing
Cornice all Brick
Brick
7th floor
6th floor
5th floor
4th floor
3rd floor
2nd floor
Brick
Windows from 3rd to 7th floor inclusive Glazed with Wire Glass
Metal Sash and Frames throughout
Terra Cotta
NOTE – Windows in offices on 2nd Floor to be glazed with clear plate Wire Glass in upper and lower Sash and Transoms
NOTE – Windows in offices on 1st Floor, except as noted, to be glazed with Clear Plate Wire Glass, also Doors and Transoms
NOTE – Track floor line level with grade on Delaware Ave
Track floor level
Pavement
Granite
C.I. Sill
Clear Plate Glass
MERCHANTS WAREHOUSE CO.
2nd floor-Water St
1st floor Delaware A
Granite Base
Water St
Datum Line
Basement floor line
Concrete

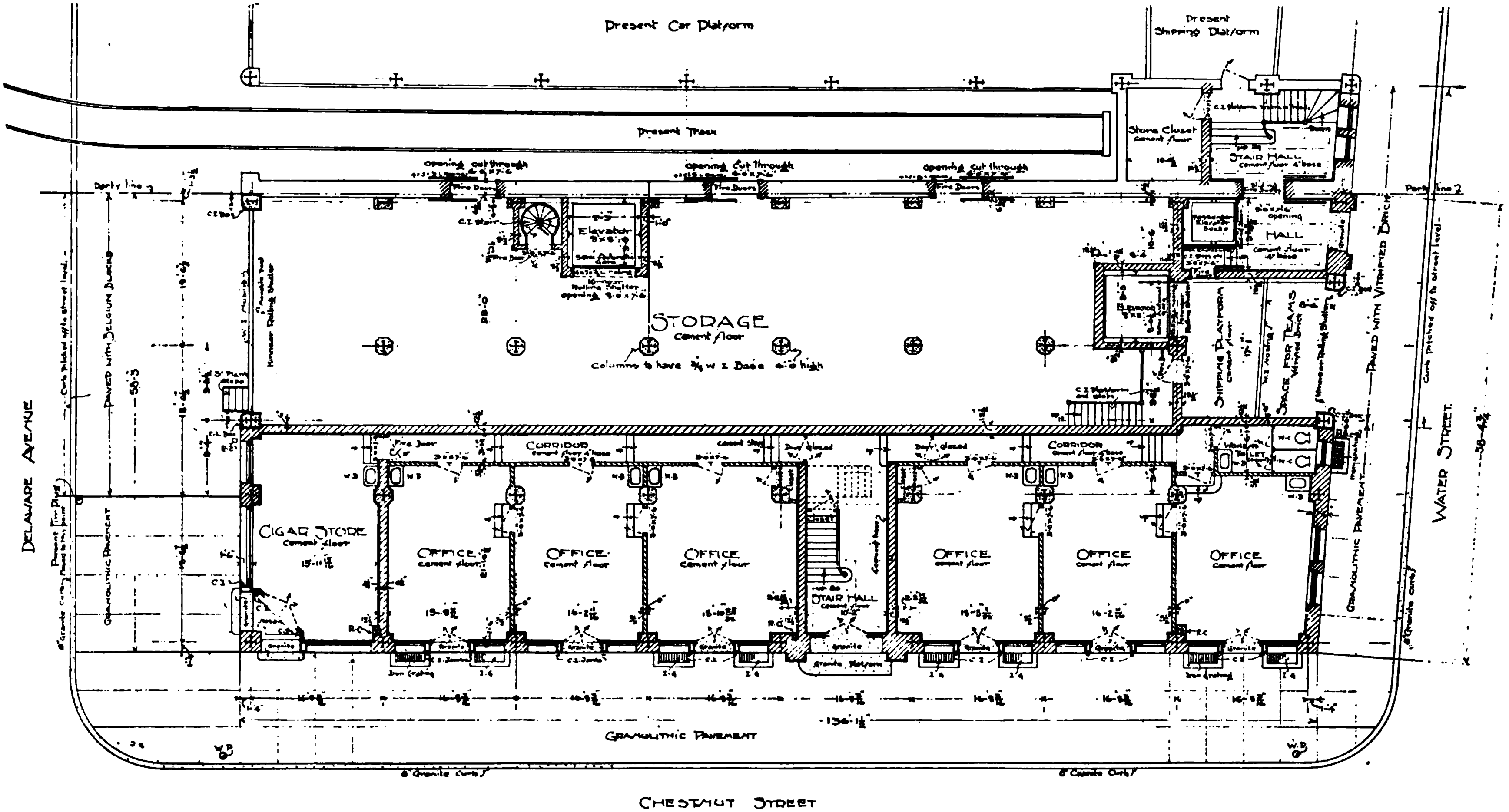
MERCHANTS' WAREHOUSE, PHILADELPHIA, ELEVATION ON CHESTNUT STREET.

NEW WAREHOUSE CONSTRUCTION IN PHILADELPHIA

BY EDWIN F. BERTOLLET.

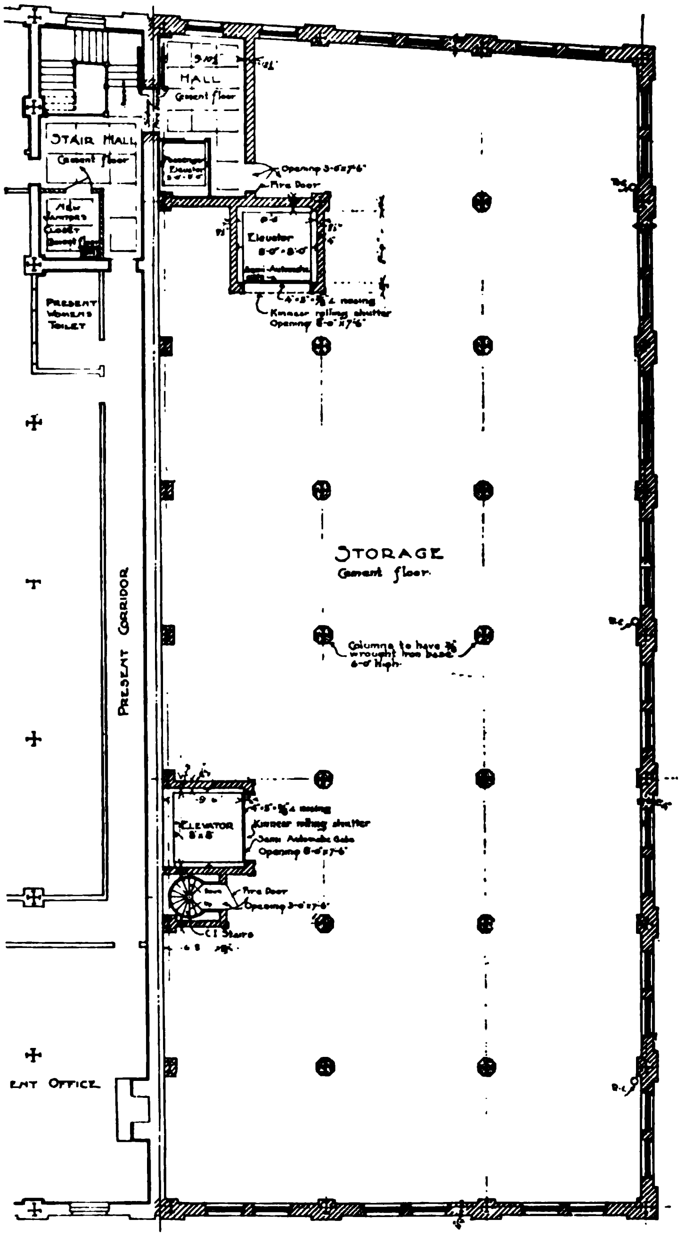
THE Merchants' Warehouse Company of Philadelphia have now in course of construction, from drawings and under supervision of the Messrs. Hewitt, architects, a large addition to their present warehouse, Delaware avenue, below Chestnut street, that promises to be so great a transformation in the company's policy of construction and methods generally, as to justify more than passing notice; in fact, it represents a distinct advance in the warehousing interests of the city. The present warehouses of the company on the site adjoining the new building now comprise about 140,000 square feet of floor space in a building whose only claim to any show of invulnerability is confined to the brick walls and iron shutters, which, however, inclose nothing more forbidding to the fire fiends than heavy timber girders, plank floors and cast-iron and square timber columns. In fact, the vastly greater percentage of Philadelphia's warehousing is done within just this sort of structure; from investigations which have been conducted along most authoritative sources of available information and verified by surveys wherever buildings have been accessible, it has been ascertained that out of some one hundred and twenty commercial warehouses in the city, offering the merchandise trade over eight million feet of floor space, there are but three buildings, comprising less than a quarter million square feet of floor space, which can be claimed as at all fireproof within the requirements of commercial purposes, and for this reason the new building of the Merchants' Company commands most special interest.

It can scarcely be claimed that the structure presents much that is new or novel, unless the liberal introduction of office apartments in the first and second floors, in close connection with storage floors, presenting the possibility of a merchant tenant establishing a wholesale or commission business under one roof in connection with his stores, can be called a novelty in a wholesale commercial establishment. However admirable may be the possibilities of this arrangement of what in reality is a large wholesale department store, it is not our purpose to herein deal with this feature of the matter so largely as it is to refer to the sober sense and seriousness with which the stability of the structure and its fire-resisting qualities have been considered in the light of the most imperative adjunct to the strictly commercial purposes of the building. For those not familiar with the immediate environment of the new building, it should be noted that Delaware avenue is the wide highway immediately along the city front and along the river of the same name, the immediate river front or east side of the avenue being occupied with the wharves and piers, with their shedding, shipping, etc., the westward side of the avenue be-



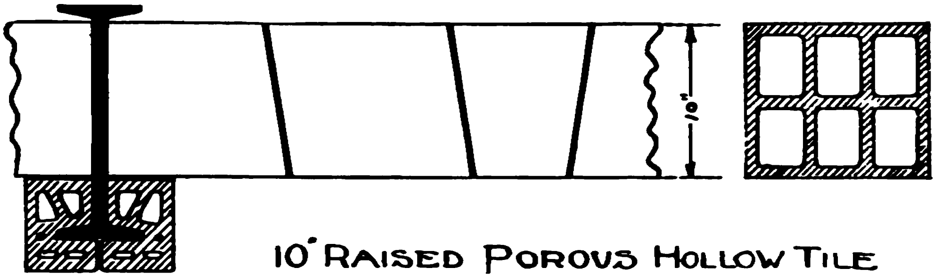
MERCHANTS' WAREHOUSE, PHILADELPHIA, GROUND FLOOR PLAN.

ing occupied variously with wholesale stores, shipping offices, supply shops and warehouses, among which are the older houses of the Merchants' Company and the new warehouse described therein. Direct railroad connections with these various warehouses is had, as may be noted by the ground plan. Water street, at the rear of the new warehouse, forms the principal street for cartage, etc., and the Chestnut street front will be occupied by offices that may be rented to patrons of the storage facilities or others, affording the rather unique possibilities to tenants above suggested.



MERCHANTS' WAREHOUSE, PHILADELPHIA, TYPICAL FLOOR PLAN.

The building, seven stories high, in ground plan 58 feet 3 inches on Delaware avenue and Water street by 136 feet on Chestnut street, will be of the steel frame skeleton construction with brick exterior and interior walls and hollow porous tile floor, beam and girder protection. The foundation being in river gravel bed, will be supported on piles, leveled for reception of concrete footing 11 feet below main high water level. The footing, covering the entire area of the site, will form the capping of the piles and a waterproofing course will cover not only the whole footing area, but will extend well up the foundation walls in order to insure a dry basement. Steel grillage beams distributing the superimposed load will be laid directly on the waterproofing course. In order that both stability and absence of moisture from the basement may be insured the concrete footing has been laid 6 feet deep about and over the tops of the piles. The foundation walls of brick will be faced on first story and above grade with heavy granite base course, pressed bricks and



10" Raised Porous Hollow Tile
Floor Arches & Beam Protection
Merchant's Warehouse
Philadelphia, Pa.

ornamental terra cotta, with molded cornice at second floor line, above which the red brick walls and facing will continue to the parapet. The window frames will all be wire glass glazed in metal double hung frames, the total area of which on street fronts would seem to be somewhat excessive for the purposes of a mere storage house, which the building is intended to be. Above the second floor there is perhaps a reason for the continuation of the office windows, throughout the stories above, which does not appear upon examination of the plans. The outside doors, excepting those to offices, will be metal covered or of the metal slat blind design, the stairways throughout will be of steel, and all elevators will be enclosed in brick shafts, with automatic doors, metal protected. All floors will be of porous terra cotta tile flat arch with raised skewbacks, combining in separate pieces 2-inch porous tile covering, or fire protection on all steel beams, and 3 inches of porous tile covering on steel girders, all of special heavy design. The ceilings, soffits, etc., to be plaster finish, and floors throughout offices and storage rooms to be cement finish on the porous tile. A fireproof vault in the cellar for especially combustible commodities and a sprinkler system for protection against possible spread of fire among stored goods, are among the excellent features of this building.

The use of wood has been entirely limited to a moderate amount in the office fronts, absolutely no other timber being used. With a warehouse of this character an accomplished fact, it is to be assumed that the old stores and warehouses which line the Delaware front and which have through some good fortune or extraordinary care of the occupants experienced a phenomenal immunity from fire (which, however, have cost their owners several times their value in insurance), will soon be supplanted with buildings of the same safe, permanent and cleanly character as that now being constructed by the Merchants' Company.

It is an easy prophecy that the business offered to a structure of this character will be only limited by the dimensions thereof and will promptly reveal a discriminating and profitable preference for the fireproof structure. The accompanying prints taken from the architect's drawings illustrate the new fireproof warehouse building in form and detail, and are explained by the respective notes under each.

REGULATING FIRE RISKS BY TAXATION

BY F. W. FITZPATRICK.

THAT more people read FIREPROOF MAGAZINE than architects, engineers, and those directly interested in construction has again been evidenced to me by the number of letters I have received during the last month or so from members of municipal leagues, citizens' societies, business men's associations and other such bodies, approving, commenting upon or asking for further information anent a suggestion made in my "Chat" in March number, where I said that the taxation upon buildings and improvements should diminish pro rata to their fireproof qualities. That idea seems to strike a very responsive chord. And it should.

Before saying anything further about it, however, I wish to disclaim any originality for that suggestion. As stated in that article it was quoted from the Editor of the *Canadian Architect,* and no saner suggestion ever came from across the border.

But why, indeed, should we stop at fireproof construction? The municipality has the right to regulate, within certain well defined lines, its process and mode of taxation. It is to the municipality's best interests that there should be no stagnation, no fossilization, no ruins and few relics within its borders. But what does it do toward eliminating or preventing these things? We decry the fire insurance companies for not making more attractive rates for fireproof and high-class construction. They advise the very best of everything, but when it comes to making rates that support those suggestions and wise admonitions, they don't do it. If we seek far enough we can find a business reason for that, however. Fire insurance is a private business, organized for gain and not on philanthropic lines. The municipality, on the contrary, without being philanthropic must needs be socialistic. It exists by and for the people, and not for the gain of the municipality as a governing body or for any individual within it. Yet the whole system of municipal taxation could not be better devised were it planned to act as a drag, a deterent to improvement. The more money you put into the betterment of any construction, or indeed the more business you do the greater benefit you are to the municipality, the more taxes you pay! In other words, as our Canadian editor friend says, "a man taxes himself for the benefit of the public, and he is taxed again on the amount of that taxation."

Without going into any Henry Georgism it would seem more reasonable, I think, to tax real estate along some well-planned line of values as to location, basing the tax upon the average of what the property if improved and built upon would be worth. As improvements are made upon that property, reduce the taxation in the ratio of that improvement's advantage to the municipality. If a citizen insists upon building a three or four story frame apartment house—and the municipality has not been wise enough to make laws to prevent him

—his tenants, spite of him, have to be very carefully protected by the municipality. There is to be an abundance of water, a well-trained fire department, and the hundred other minutiæ to save that property and its occupants from annihilation in case of the imminently possible fire. The city has to pay for all that protection; his percentage of that taxation is now exceedingly small, compared to the amount of protection his property receives. On the other hand, suppose a citizen who is as public spirited as he is wide awake to his own interests builds upon a similar piece of property a thoroughly fireproof building. It requires the very minimum of protection from the municipality and is not of the slightest danger to its environing buildings. That man is a distinct benefit to the city. His taxation should be the very lowest. In the course of years his building deteriorates but very little and the tax upon his property should remain about as it was originally set. The other man's property is deteriorating very rapidly and becomes a greater menace to its surroundings as years go by. He dosen't tear down the building and rebuild it properly; he is satisfied with the percentage he is making upon his investment and as far as the city is concerned, and his tenants, why, they may be hanged for all he cares. That man's tax, I contend, should be increasing year by year, for he is costing the city more every day that structure remains. Indeed, the increase in such taxation should be such as to very rapidly reach the point where in sheer self-defense that man will turn over a new leaf and build properly. Or, to make myself still more clear let me develop the idea in figures. The city, through its assessors, says that such and such a section of the place is suitable for office and retail business purposes, such another part manufacturing, and such another part residence, and still another wholesale, et cetera. The values of the respective parcels are established relatively and the taxes upon the property are made flat at such a rate, let us say 5 per cent. Therefore the owner pays 5 per cent on the value of his lot, whatever that may have been fixed at. Suppose he builds an ordinary structure upon that lot. While ordinary, it is nevertheless an improvement and let us say that as long as there is nothing very near it, it is not an extraordinary menace to the surroundings nor does it entail any great expense on the part of the city for protection. He will pay 4 per cent on his total investment, including the value of the lot. Another man builds an extraordinarily fine building, a distinct improvement to the city. It is absolutely fireproof and entails no cost to the municipality for protection; that man should pay 1 per cent on his total investment, including the real estate. But a third man comes along and insists upon building a fire trap. Assuming that the laws have not been made adequate to prevent him, then Mr. Man is a distinct menace to the city and is going to cost it the maximum for protection; he should pay 10 per cent, 15 per cent, or any prohibitive rate the authorities have sense enough to impose.

How is that for a new system of taxation? Revolutionary, socialistic, et al.?

No, it's not silly. Just stop and think it over for a while. After very little thought you will agree with me that it is eminently proper and sane. Some may say that it is too revolutionary and would tamper with individual rights, the orderly course of affairs; it would be illegal. All of which objections, I respectfully submit, do not amount to a row of pins. From a legal point of view, a municipality is about as autocratic a democracy as one can think of. Suppose the liquor men have had their way and bars have flourished like green-bay trees. There has been little or no tax upon the traffic. Suddenly people awaken to the fact that things are not as they should be. They elect a clean council, and a high license is put upon the liquor traffic, so high that many bar-rooms cannot stand it and are put out of business. Or the council may restrict the traffic otherwise, prohibiting bar-rooms in certain districts and permitting only so many to the square mile, and so on. That's "tampering with individual rights." That's absolutely destroying what had been the value of certain property. Why stop there? Go on with the amelioration of conditions. The scheme outlined is not Utopian altogether. At first blush we may think it is, simply because of our prejudice, inborn, inherited in most part from a long line of English ancestors that for ages and ages have levied taxes in a certain manner; and few of us, so far, have had go enough in our composition to even clamor for something better.

Such a scheme would, after a little while, work just as well and effectively and easier by such than the drastic reforms many of us who pass for sane men, too, are clamoring for; and that is so complete a revision of building laws as to absolutely prevent the construction of all but first-class buildings hereafter. By first-class buildings I mean a building that cannot burn and will not be very much damaged by a conflagration among its older neighbors. Such a prohibitory law would be effective in all new work, but would accomplish absolutely nothing toward the improvement or demolition of the older and poorer buildings; nay, indeed, it would have a tendency to keep them longer in service and, if anything, would discourage building. The scheme we have just glanced at would be the highest encouragement all along the lines of improvement. You may say that a tax, after all, does not amount to much; but a tax, however small, appears as a bugaboo to the average man. In truth, do not some of our wealthiest men absolutely perjure themselves to avoid the paying of a few hundred dollars in taxes? A sum they would never notice, spending on the most frivolous things vastly greater amounts.

The devising, revising and arranging of building laws is a ticklish job at best. In the last year or so I have had a good deal to do with them, and it is absolutely dumfounding to note what considerations, what influences, what intimidations are brought to bear for the most trivial personal reasons in order to prevent really good action. The *personal,* the ego, controls the world. A man may give thousands towards hospitals, education and what-not, but if a building ordinance, for instance, is going to compel him for the sake of his neighbors, the general weal, to spend five pennies more than he thinks he can get along without spending, then he is up in arms and will bring all his batteries to bear upon you, his aldermanic cohorts, his hired legal talent, the oratory of the ward, everything to prove to you that that particular thing should not be done. Why, confound them, I've known business men to spend ten times what the change in their building plans would involve to defeat a proviso in the building ordinance which would force them to make that change. Business men do queer things anyway. I have a case before me now, in a city that has lately insisted upon fire-escapes on all buildings where people sleep at night, but leaving it optional whether they be placed upon buildings occupied in the daytime only, or not (?). This man rather than spend the $800 his fire escape would have cost him refuses to make leases for his rooms to be occupied as sleeping apartments, which privilege has brought him heretofore between $400 and $500 a year additional over his regular rentals, artists and others of that class using the rooms as studios as well as places of abode. That is assuredly an example of biting one's nose off to spite his face, which is not unfrequently seen.

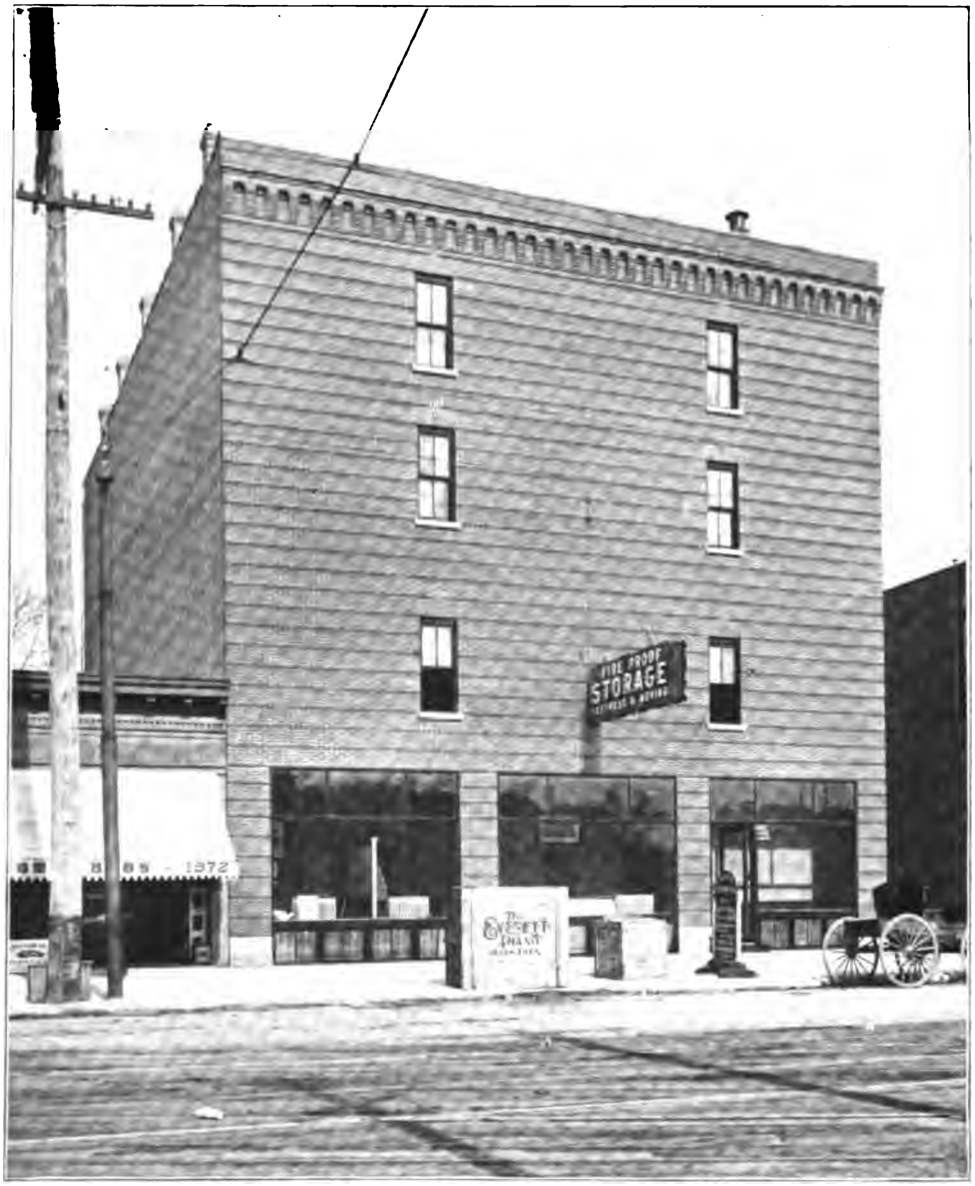


FIGURE 1.
LIVINGSTON FIREPROOF WAREHOUSE, 1968-70 EVANSTON AVENUE, CHICAGO.
The late Fred Alschlaeger, Architect.

ILLUSTRATION OF DIFFERENCE IN TIME REQUIRED FOR EXECUTION BETWEEN BURNED CLAY AND CONCRETE FIREPROOFING

Figures 1 and 2, above shown, and the titles of which are under each of them, show two storage warehouses of almost exactly the same size, in close proximity to each other and commenced about the same time. They are introduced to show the relative time required to complete such buildings when

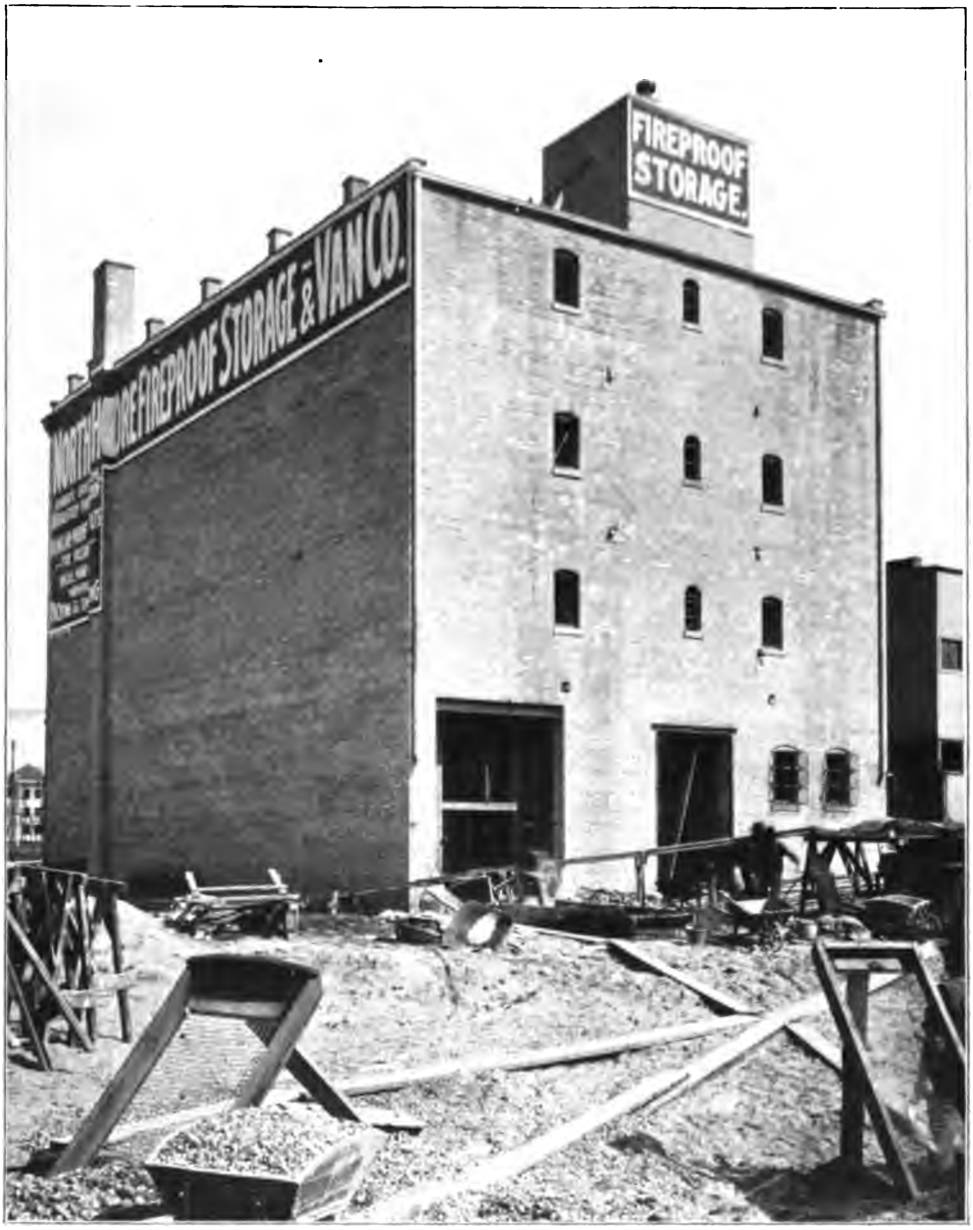


FIGURE 2.
NORTH SHORE STORAGE AND VAN COMPANY'S WAREHOUSE, 2077-79 EVANSTON AVENUE, CHICAGO—REAR VIEW.
F. W. L. Foehringer, Architect.

one is fireproofed with burned clay products and the other with concrete. Number 1 was started November 21, 1904, and finished and occupied April 21, 1905. The fireproofing was all done in eighteen working days. The whole is of tile construction and protected steel throughout. Number 2 was commenced, as stated by the architect, at "end of November, 1904," and on May 16, 1905, he writes that it "will be ready for occupancy in a few weeks." The interior construction is reinforced concrete. Both pictures are from photographs taken on the same day and speak for themselves.

RANDOM NOTES

BY F. W. FITZPATRICK.

EVEN when used in great masses (where I most unhesitatingly recommend it) concrete has to be handled most gingerly, and though it be under the direction of the most expert no one can take chances with it, though, after all, the element of chance enters very largely into its composition. There is building over Rock Creek in Washington a great concrete bridge, a much heralded work of the Engineer Corps. It has been described and commented upon, and commended and everyone was very proud of it. A few weeks ago a pretty bad crack showed itself. Engineers aver that it is not serious, but it surely is somewhat unsightly. Major Morrow, who is in charge of the work, thinks he can repair the damage for $5,000 or $10,000. The cost of repairing the work is not what I am interested in, but as the army engineers are, so many of them, in favor of concrete in almost any form or for any purpose, especially monolithic armored floor construction, a statement made by Major Morrow in answer to a question asked him anent this bridge is of peculiar and particular interest to us just now. To the inquiry as to whether steel beams were not generally used in concrete he is said to have replied: "It is in some railway work, but that is not necessary for the strength of the concrete. It is cheaper to fill the concrete shell with steel work, but in this case we have an abundance of concrete and there is no necessity for the steel. *The concrete requires about two years to completely harden, but it acquires most of its strength, about ninety per cent, I believe, during the first few months it is in position. The wall that has broken was built about six months ago.*"

* * *

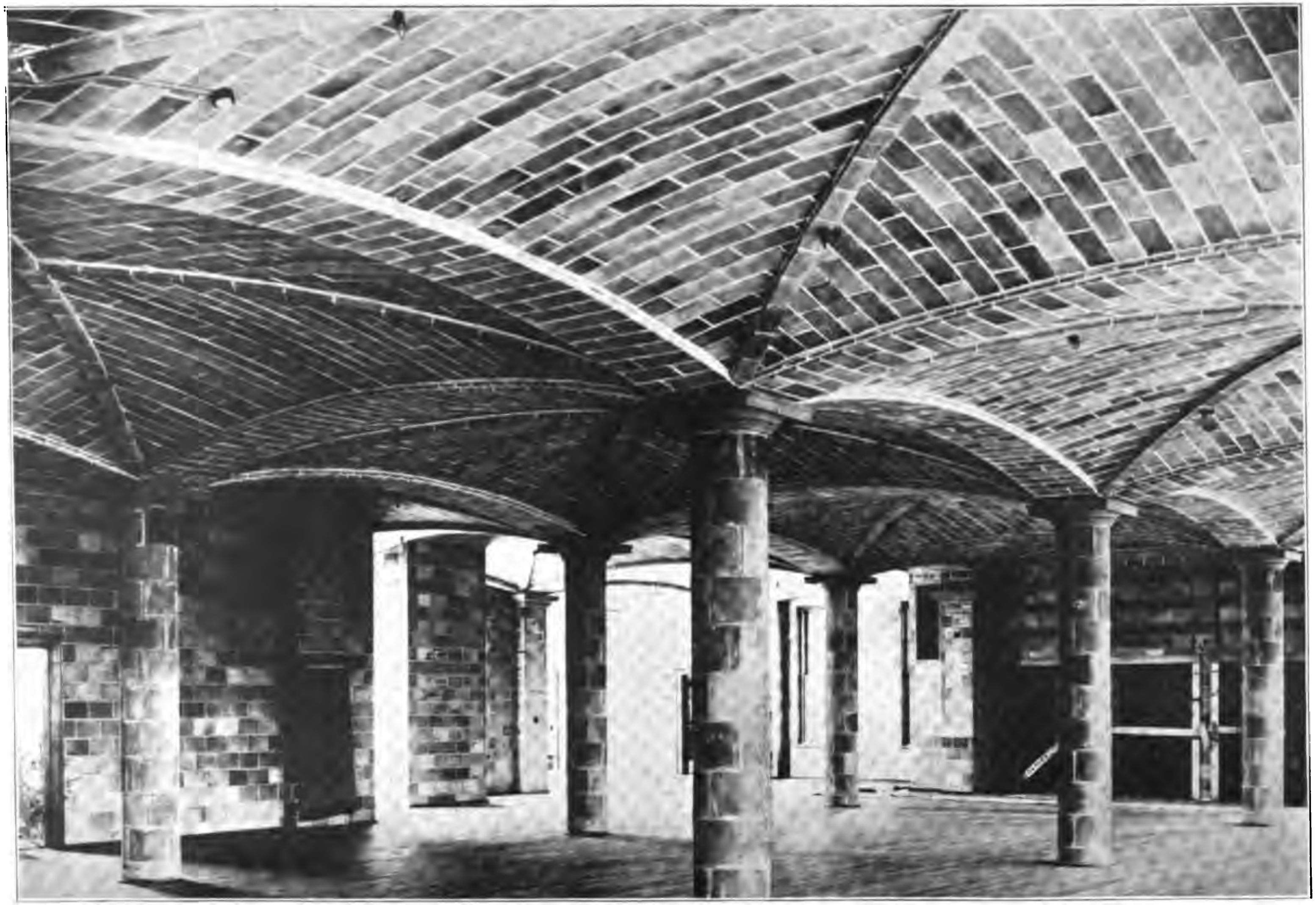
Mentioning concrete makes me think of concrete blocks, a subject that is interesting to many people, particularly our rural friends. Much has been said and written about the fireproof qualities of these blocks. They are generally not made of cinder concrete, either, but, as a rule, of very good material and containing a far greater portion of cement than the usual floor slabs and other concrete mixtures. A friend of mine has just sent me a paper, the *Duluth Herald*, to be exact, showing a picture of a building that was built of concrete blocks many years ago. The reporter or contributor enlarges upon the fireproof and lasting qualities of concrete blocks, their resistance to climatic influences, et cetera, et cetera. He states that the building was erected in 1883. Then, toward the end of his article, not being a concrete fugelman, nor having been posted by concrete experts as to what to say and what to leave unsaid, he naively relates that "the building was destroyed by fire in 1885 (a two-story building standing on the corner of rather wide streets), the heat being so intense as to ruin the concrete blocks. Later, the owner erected the substantial brick store office building now standing on the site. . . ."

* * *

It is particularly interesting to note how recently singed cities are profiting by their hard lessons and experience. Baltimore, essentially a southern city, is disappointing. Immediately after the great fire there was much talk there about what a fine class of buildings would replace the destroyed ones, while as a matter of fact there are, very true, a few good buildings going up, but the great bulk of the construction under way is of an exceedingly inferior class, just as flimsy and as inflammable as the laws and special exemptions will permit. In Minneapolis, a western city, the building inspector says in a recent communication: "I am pleased to report, however, that the buildings now being constructed all over the city are much more substantial than were those constructed a few years ago. I have lately succeeded in having our building ordinances so amended that, hereafter, we will construct more fireproof buildings and better than heretofore," and I know that Brother Houghton will succeed in what he undertakes. Minneapolis is lucky in having such a man for its building inspector. In Toronto our Canadian friends, architects and owners of property, do not seem to possess as much sense as what we have quoted before from the editor of the *Canadian Architect* would indicate was lying around in that interesting Canadian city. I received a report from there which states that not more than half a dozen structures have been erected since the big fire which even lay any claim to being in the fireproof class. Not one of them would pass muster as an exceptionally good risk. They are of reinforced and other forms of concrete, expanded metal, cast iron columns, and such other combinations, while the majority of the warehouses are being built of the ancient and respectable mill construction style, in so far as the floor construction is concerned, but without the closed hatches, tower staircases, et cetera, that made that form, the real thing, a little slower burning than the ordinary. There is an unprecedented amount of work being done in Toronto, but most of it is ordinary construction. The good people there seem to think they have done their duty fully when they have made their walls of brick and their roofs of slate or tin. Many there refer to that as "fireproof" construction!

* * *

Things are moving along in spite of the anchors and drags and fossils and barnacles. A few years ago if one suggested anything but wood for interior finish he would have been laughed at. I have just seen a set of plans for a building in which there will not be a particle of wood and exceedingly little metal used, and that amply protected. The building will be a handsome one, too, beautifully finished, and as pleasing an exterior as one could wish for. The outer walls and partitions and foundations are all of hollow tile. The floors and roof are of monolithic Johnson system, tile and cement. The outer walls are finished with stucco, marble-dusted before quite dry and enhanced with bands and ornaments in well selected and harmonious colored enameled brick. The roof is covered with "Century" shingle, a shingle made of asbestos and cement, compressed under a very great weight. All the interior finish, some very handsome designs, too, and the floors, the stairs, wainscoting and all that sort of thing usually made in wood are designed to be of the same material, called "asbestofer." It is a material invented by a German and controlled in this country by the Keasbey & Mattison Company, the forms and mode of assembling for fireproof windows, doors, et cetera, et cetera, the stairs, and in fact all the details of constructive finish having been devised very recently; the patents are not even yet issued. The material and these patented forms are bound to create quite a stir in the building world. The cost of manufacturing is not great, the possibilities of the thing are unlimited, the material is indestructible, light, improves with age, does not warp or twist or get out of place as does wood, can be bent like metal, nailed like wood and put upon the market for as little or less than the most ordinary timber. It will soon come to pass that there will be neither rhyme nor reason in paying $30 and $35 a thousand for ordinary building lumber. Let them use their lumber in making boxes, railroad ties, and so on, but keep it out of buildings, where it a menace and a danger.



INTERIOR OF UPPER FLOOR IN GORHAM MANUFACTURING COMPANY'S BUILDING.
Fifth Avenue and Thirty-sixth Street, New York City; McKim, Mead & White, Architects; Guastavino Fireproof Tile Construction; not to be plastered.

PROTECTING BUILDINGS FROM LIGHTNING

BY GEORGE E. WALSH.

THE danger from lightning in the modern fireproof building is reduced almost to a minimum, but protective apparatus has in the past few years been developed to a degree of efficiency that should further eliminate the risk. In 1904 the National Fire Protection Association reported that out of an average of 71,469 fires, involving a loss of over $156,000,000, no less than 3,151 fires, representing a loss of $4,353,437, were caused directly by lightning.

The old lightning rod protection has in recent years fallen into general disfavor, or at least inattention. The cause of this has been the question raised about its utility, and so long as there was any doubt about its protective value the lightning-rod agent had difficulty in securing customers. The equipment of modern buildings with lightning rods is to-day the exception rather than the rule, and in fireproof buildings very few such protective apparatus have been installed in our cities. Nevertheless, owing to their height, the modern sky-scraper office building of fireproof construction offers unusual opportunity for lightning to strike.

Last year the Fire Protection Association took up the matter seriously and attempted to formulate rules concerning the protection of buildings from this danger. In the investigations which followed some interesting and important conclusions were reached, the value and utility of which may be demonstrated the coming summer.

Last year at the meeting of the Birmingham Architectural Association, England, Sir Oliver Lodge stated that in his opinion copper conductors were not so good as iron ones for preventing disasters from lightning strokes. His reasons for this radical idea were that the copper conductors did not damp out the oscillations, and they let the current down too suddenly, thus causing in many cases side flashes. An iron conductor might be destroyed by one flash of lightning, but by the time the flash was over the conductor had achieved its purpose, and it could be renewed by another. The cost of one copper conductor would be more than two iron conductors of good material suitable for the purpose of protecting the building from lightning. But as a further extreme statement of the case, the speaker said that where is was desirable for a building to be absolutely immune from lightning, such as powder magazines, guncotton factories or mills filled with very combustible materials, it would be necessary to provide a complete metallic enclosure such as a banker's strong room, and then the only possible way for the lightning to damage the building would be to melt it. However, as a modern building might even then retain the charge it would be wise to have sky and roof terminals.

The question of providing lightning arresters in connection with large electrical power and generating houses and factories has in recent years received a great amount of attention. Ever since the partial destruction of the big power house at Niagara Falls, in which several of the large turbines and generators were destroyed by lightning, the reality of the danger from this source has been apparent. The high tension wires carrying heavy currents are to-day provided at intervals with lightning arresters which will protect the power houses and transforming stations from damage.

The whole question of reviving the old-fashioned lightning-rod protection on buildings, factories, mills, power houses and similar structures is thus an important one. The electrical companies are the leaders in this movement. They have suffered the most from fires caused by lightning strokes, and in spite of fireproof structures they have found the danger from this source very great. In recent considerations of the subject it has been recognized that two distinct classes of discharges must be dealt with. The first of these is the direct discharge from the clouds, and the other is the induced discharge which is apt to be built up on all overhead circuits during the presence of a thunderstorm. In some respects this latter is more inimical to life and property in cities than the former. Where trolley and other power wires are strung overhead in the streets, the induced charge of lightning may prove very dangerous and erratic. The vagaries of lightning have always been puzzling, and in some respects the induced charges on overhead circuits are the most uncertain.

The induced charges appear to be built up on overhead circuits under almost all kinds of atmospheric conditions, but usually by the approach of a charged cloud. The erection of a large number of pole lightning arresters along the lines of a circuit is becoming the general practice to-day to reduce the lightning hazard to a minimum. The ground connections of these lightning arresters are of the lowest possible resistance. Furthermore, kicking or choke coils are provided at the stations on either side of the circuit, between the dynamo and the arresters, to protect the machinery from a sudden discharge.

The danger from induced discharges, which electrical companies experience, is in a lesser degree present in ordinary buildings were dynamos and generators are used for lighting or power purposes. The absolute protection of the building from such outside discharges depends upon the equipment of the building and the installation of wires and cables. Usually an induced charge that enters a building by way of the power wires or cables punctures the insulation and burns out the dynamo instead of going through the coils of the motor. When the dynamo is burnt out by such a discharge, the lightning goes directly to the ground, if the conductors and insulation of the engine room have been properly made.

The danger from lightning which a modern building experiences is thus from above and below. The direct discharge from the clouds may be conducted by lightning rods to the ground, and the discharge from outside circuits may be carried through the dynamo to the ground in a similar manner. The injury to the building in either case can be made small.

The protection of a building from overhead discharges requires different forms of treatment, and the various metals and materials of construction must be considered. Ordinary fireproof clay materials are as a rule poor conductors of electricity, and they offer a high resistance to electrical discharges; but the amount of metal frequently employed on the roofs, skylights and windows of such buildings offset the relative immunity obtained from fireproof brick and tiles. Last year in its investigation of the subject, the American Fire Protection Association recommended that conductors should be fastened to metal of the same nature, so that if any part of this metal work should attract a discharge the electric fluid would immediately find its way to the lightning rod. The old method was to insulate the rod from the building, thereby breaking all connection with the metal part of the structure, and the protection was assured only so long as the discharge hit the rod instead of the metal of roof, skylight or windows.

Lightning rods properly installed, or rather lightning arresters, are of value in protecting modern high buildings, electrical power plants, factories and mills. They facilitate the discharge of the fluid to the earth, carrying it off thus harmlessly, and they tend to prevent disruptive discharge by neutralizing the conditions that determine the direction and force of the bolt.

Two years ago an attempt was made by the insurance companies to formulate some general rules regarding the use of lightning rods, and it was preliminarily recommended that one rod with proper area and earth terminals should be provided for each 2,000 square feet of pitched roofs of metal, and one for each 5,000 square feet of area for pitched roofs other than metal. Practically the same rule applied to flat roofs. On roofs built entirely of fireproof material, with absolutely no metal used in skylights, water tanks, elevator fixtures, chimneys and flag poles, one lightning rod was deemed sufficient for less than double the area as given above.

Only the one kind of material was recommended for use in the same system. If copper is employed as the conductor, it should be in sheet or tape form, and should weigh not less than six ounces per foot. Where iron conductors are used, the weight should not be less than two and a quarter pounds to the foot. The height of the cone-shaped upper point should be equal to the radius of the base. The air terminals should extend not less than three feet above the roof or chimneys, and they should run as straight as possible, avoiding turns and angles, and the conductors should not be insulated, but attached, if possible, to similar metal used in roof construction. The conductors should not be run through iron pipes.

One of the most important parts of the lightning protection system is the grounding of the conductors. In a good many instances poor grounding has caused disruptive effects near the foundations of the buildings so that great damage has been caused. Architects not acquainted with the peculiar effects of electricity have often been content with installing the lightning-rod system, and then left the final grounding to inexperienced workmen. In many cases the earth-plates have been merely buried in the ground close to the foundations of the building. Owing to drainage, this ground soon became dry, and the high resistance which followed would naturally cause the lightning to deflect and pass into the building instead of into the ground. The underwriters and insurance companies who have studied this problem insist upon a copper plate not less than two by two feet, one-sixteenth of an inch thick, being buried in a permanently damp hole beneath the frost line. Permanently moist ground cannot, it is claimed, be depended upon at a distance of less than four feet from the surface, and if the copper terminal is buried in a hole of this depth there is no danger from proper grounding of a bolt of lightning. To prevent the copper plate from being injured by an accumulation of water in such a hole, a bed underneath of three inches of crushed coke or charcoal is recommended, and the same material above for a distance of nearly six inches of the surface.

There is very little advantage in protecting a building with lightning rods and then failing to ground the conductors properly. In fact, it has been found that more damage has been done to buildings equipped with lightning rods improperly grounded than where none at all are used. This is particularly true of immense buildings ranging from ten to twenty stories. The damage done by the lightning in such cases is not so much from fire as from destruction and weakening of foundations. A heavy bolt that is not properly grounded may shake the foundations of a building to such an extent as to cause expensive repairs. The structure itself may be cracked from the foundation up to the third or fourth story. In buildings constructed of fireproof clay tiling this cracking of the walls by an improperly grounded lightning bolt has many times produced serious losses. For this reason a careful grounding of the conductor in permanently moist earth, which will immediately carry away and dissipate the current, is important, and the apparent zealousness of the insurance and electrical engineers in specifying minute details for constructing this part of the system is well taken.

In London similar investigations of the

danger of buildings from lightning have been made within the past year or two, and the question asked if lightning rods were superfluous. After lengthy detailed reports gathered from insurance companies and builders, it was concluded that the lightning rods are of great value as protective devices to buildings, but that many of the old-fashioned equipments of rods were failures for very simple and apparent reasons. The first of these causes was attributed to the insufficient number of conductors and earth connections for each thousand square feet of roof surface. The second cause was due to the improper equipment of the buildings with rods, or bad earth connections, such as wrong methods of burying the copper earth-plates and protecting them so that frost and dry weather could not affect their usefulness. The third reason for the apparent failure of the old-fashioned lightning rods was attributed to the absence of any system of connecting the metallic portions of the buildings to the conductors, especially the interconnection of the finials, rain-water pipes and girders. In central Europe it was found that danger from side flashes from the conductors was greatly lessened by running a horizontal conductor along the ridge or parapet of all the roofs. This method is to-day practiced generally on the continent, and it has proved most satisfactory.

THE INTERNATIONAL FIRE SERVICE COUNCIL, MEETING OF THE EXECUTIVE

THE following condensed account of the meeting of the executive of the International Fire Service Council at Brussels (Belgium) on April 17 and 18, furnished by Mr. Edwin O. Sachs of London, one of the vice-presidents, will be of interest to all people throughout the world who have at heart the preservation of life and property from fire:

The annual meeting of the executive of the International Fire Service Council was held at Brussels on April 17 and 18.

The three vice-presidents attending the meeting from France, Germany and Great Britain were: Commandant Cazier, past president French Fire Service Federation; Mr. Edwin O. Sachs, F. R. S. Ed., chairman of the British Fire Prevention Committee; Chief Officer Westphalen, Hamburg F. B., late superintendent of buildings, chairman German Professional Fire Service Association.

The other executive members attending were: Chief Officer Chev. Goldoni, C. E., Milan F. B., president Italian Fire Prevention and Fire Brigades' Association; Chief Officer Col. Sextus Meyer, Copenhagen, late of the Danish Royal Engineers; Chief Officer Meier, Amsterdam F. B., late of the Dutch Royal Engineers; Mr. Ladislas Malkowsky, extra equerry to the czar; Mr. Phillips, Termonde, honorary secretary Belgian, and Mr. G. de Marie, Luxemburg, general honorary secretary.

The only executive officer unfortunately unavoidably prevented from attending the meeting was Count Victor Szechenyi, M. P., president Hungarian Fire Brigades' Union.

Col. Sextus Meyer of the Copenhagen professional brigade was unanimously elected chairman of the executive for the next two years. Colonel Mayer is one of the senior professional officers of the continent, formerly a lieutenant-colonel of the Danish Royal Engineers, a linguist, and personally very popular.

The organization of the I. F. S. C. Inquiry Bureau at Luxemburg was completed, and it has been arranged that the technical work of the council and of the inquiry office will be done by several special commissions (of five members each), which will deal with the following subjects respectively: (1) Organization and Fire Appliances; (2) Fire Alarms; (3) Fire Prevention; (4) Congress Matters.

There will also be a special commission to deal with the question of international relations.

The chairmen of the commissions are, respectively, Messrs Westphalen, Hamburg; Meier, Amsterdam; Sachs, London; Goldoni, Milan, and Col. Sextus Meyer, Denmark.

The following British members of the council have been nominated to seats on the special commissions, namely: Chief Superintendent Thomas, Fire Appliances; Mr. Ellis Marsland, Fire Prevention; Mr. Horace Folker, Congress Matters.

The arrangements under which the Inquiry Bureau will be conducted at Luxemburg will, it is anticipated, allow for fairly prompt technical replies being obtained by members of the council and the societies and federations they represent.

Questions regarding future publications by the council were discussed at considerable length, and some interesting announcements are anticipated shortly, one of which will relate to the publication of an English, French and German dictionary of fire technical terms, which should fill a long-felt gap in the fire service and be of considerable utility. The necessary honorary workers and funds are available, and this dictionary should be ready in about eighteen months. The editors of the dictionary will be Messrs. Dittman, Bremen; Meier, Amsterdam, and Sachs, London.

The commission dealing with the questions of international relations in the fire service is intended to treat them on broader lines, having special regard to the general movement toward amity among the principal nations of Europe and the beneficial influence that could be exerted by the fire service, which comprises some three million souls.

One of the results of the conference at Brussels has been that a better understanding has been arrived at between certain Belgian professional officers and the council. Commandant Welsch, the "candid critic" of the council's earlier dearth of useful work, was in constant touch with members of the executive, and will henceforth co-operate with the council in the execution of its program.

Regarding the congress to be held at Milan, the arrangements will be made under the auspices of the council and on lines which will serve as a skeleton for future congresses, so that there will be no clashing in the work done, and the reports of the papers, etc., will be issued in a uniform manner.

The members of the special honorary congress committee at Milan include, among others, Colonel Fox, Messrs. Dyer, Sachs and Dyson, but the official announcement of the English supporters of the congress will not be issued until the preparations are further advanced.

The work of the executive was of an onerous character, involving several lengthy sittings, as also important conferences with the principal officials of the Belgian home office. The French language was used in discussion.

It is the executive's intention to invite the National Fire Protection Association, the Association of Fire Engineers, the Volunteer Association and the Boston Experiment Station to nominate men of technical standing to the council, as the United States is not yet suitably represented. Professor Woolson will also be invited to join.

BUILDINGS AT BALTIMORE IN WHICH BURNED CLAY PRODUCTS HAVE BEEN USED FOR FIREPROOFING SINCE THE GREAT FIRE

Great prominence has been given by certain journals to statements about the great number of new or reconstructed buildings at Baltimore in which concrete construction or fireproofing has been used since the great fire. These statements have been refuted in other publications, and we have nothing to do with them. But we have had prepared, after considerable labor, what we believe to be a correct list of buildings at Baltimore in which clay products have been used for fireproofing. In the following buildings clay products have been used throughout:

Baltimore Stock Exchange.
Union Trust building.
Dormitory, Johns Hopkins University.
J. Henley Smith building.
Mercantile Trust & Deposit Bank.
Store, P. B. Satler estate.
Henry Smith warehouse.
Hopkins Place Savings Bank.
Equitable building.
Hutzler Bros.' store.
Calvert building.
Franklin building.
Baltimore-American building.
Gaither building.
Continental Trust building.
W. D. McLaughlin restaurant.
Donnell building.
Miller building.
Merchants' Club.
National Mechanics' Bank.
C. D. Kenny warehouse.
German-American Fire Insurance building.
Lamb warehouse.
Thomas & Thompson warehouse.
Platt street warehouse.
Hotel Caswell.
Levering building.
R. P. Goodwin restaurant.
Stewart-Crook Hardware Company's store.
Abell apartment house.

In the following buildings hollow burned clay tiles have been used for partitions only, and some of them are otherwise fireproofed with concrete in some form:

Maryland Hotel.
National Union Bank.
Maryland Casualty building.
National Marine Bank.
Maryland Life Insurance building.
Baltimore News building.
Commercial & Farmers' National Bank.

EXTRACTS FROM THE NEW BUILDING ORDINANCE OF THE CITY OF CHICAGO

ADOPTED MARCH 13, 1905

CONSTRUCTION OF FIREPROOF BUILDINGS.

910. (Skeleton Construction.) — The term "skeleton construction" shall apply to all buildings wherein all external and internal loads and strains are transmitted from the top of the building to the foundations by a skeleton or framework of metal. In such metal framework the beams and girders shall be riveted to each other at their respective junction points. If columns made of rolled iron or steel are used, their different parts shall be riveted to each other, and the beams and girders resting upon them shall have riveted connections to unite them with columns. If cast-iron columns are used, each successive column shall be bolted to the one below it by at least four bolts not less than three-fourths of an inch in diameter, and the beams and girders shall be bolted to the columns. At each line of floor or roof beams, lateral connections between the ends of the beams and girders shall be made in such manner as to rigidly connect the beams and girders with each other in the direction of their length.

911. (Walls—Enclosing.)—If buildings are made fireproof entirely, and have skeleton construction so designed that their enclosing walls do not carry the weight of floors or roof, then their walls shall be not less than twelve inches in thickness; provided, such walls shall be thoroughly anchored to the iron skeleton, and whenever the weight of such walls rests upon beams or columns, such beams or columns shall be made strong enough in each story to carry the weight of wall resting upon them without reliance upon the walls below them. All walls shall be of fireproof or incombustible material.

912. (Columns—Exterior.)—All iron or steel used as a vertical supporting member of the external construction of any building exceeding sixty feet in height shall be protected as against the effects of external changes of temperature, and of fire, by a covering of fireproof material consisting of at least four inches of brick, or of four inches of concrete, or of four inches of burnt clay tiles, or four inches of hollow terra cotta, or of a combination of any two of these materials, provided that their combined thickness is not less than four inches. The thickness of four inches shall be measured from the extreme projections of the metal of the column proper.

Where stone or other incombustible material is used for the exterior facing of a building, the distance between the back of the facing and the extreme projections of the metal of the column proper shall be at least four inches, and this four-inch space shall be filled with one of the "fireproof materials."

In all cases, the brick or burnt clay, tile or terra cotta, if used as a fireproof covering, shall be bedded in cement mortar close up to the iron or steel members, and all joints shall be made full and solid.

913. (Fireproofing of Exterior Sides of Mullions.)—In buildings required by this chapter to be of fireproof construction, all vertical door or window mullions over eight inches wide shall be faced with incombustible material; horizontal transom bars over six inches wide shall be faced with a fireproof or with an incombustible material.

914. (Spandril Beams, Girders, Lintel.)—The metal of the spandril beams or spandril girders, or lintels of exterior walls, which support a part of exterior walls, shall be covered in the same manner and with the same material as specified for the exterior columns in this ordinance. The covering thickness shall be measured from the extreme projection of the metal in every case.

915. (Fireproof Covering Independent.)—All covering of brick, concrete, burnt clay tiles, hollow terra cotta or of a combination of any two of these materials shall be applied to all of the structural members of the exterior of a fireproof building previously and independently of the application of the architectural facing of such a fireproof building with an incombustible or fireproof material.

916. (Iron or Steel Plates for Support of Wall.)—If iron or steel plates or angles are used

in each story for the support of the facings of the walls within such story, such plates or angles shall be of sufficient strength to carry the weight within the limits of fiber stress for iron and steel elsewhere specified in this ordinance, the enveloping material for such story, and such plates or angles may extend to within two inches of the exterior of such covering.

917. (Walls, Support and Fireproofing of.)—Where skeleton construction is used for the whole or part of a building, the enveloping material and the walls shall be independently supported on the skeleton frame for each individual story.

918. (Terra Cotta.)—If terra cotta or other hollow blocks are used, as fireproof covering, they shall be backed up with brick or hollow tile or concrete; whichever is used shall be, however, of such dimensions and laid up in such a manner that the backing will be built into the cavities of the facing so as to secure perfect bond between the facing and its backing.

919. (Coping.)—The upper surfaces of all breaks or offsets in external coverings and fillings and walls, as well as the tops of walls, shall be covered with stone, terra cotta, metal, concrete or fire-clay copings set in cement mortar. Copings of all kinds which do not have lapped joints shall be pointed with mortar composed of one part of standard Portland cement and two parts of torpedo sand.

920. (Columns—Interior.)—The covering of interior columns shall be one or more of the fireproof materials herein described.

If such covering shall be of brick or concrete it shall be not less than four inches thick; if of burnt clay tiles, such covering shall be in two consecutive layers, each not less than two and one-half inches thick, with one air space; if of porous clay solid tiles, it shall consist of at least two layers not less than two combination of any two of these materials, one-half of the total thickness required for each of the materials shall be applied, of each of such materials. Whether hollow tile, porous tile or terra cotta is used, the two consecutive layers shall be so applied that neither the vertical nor the horizontal joints in the same shall be opposite each other, and each course shall be so anchored and bonded within itself as to form an independent and stable structure.

In all cases the brick or hollow tile, solid tiles or terra cotta shall be bedded in cement mortar close up to the iron or steel member, and all joints shall be made full and solid.

In the case of columns having an "H" shaped cross section or of columns having any other cross section with channels or chases open from base plates to cap plates on one or more sides of the columns, then the thickness of the fireproof covering may be reduced to three inches, measuring in the direction in which the flange or flanges project, and provided that the thin edge in the projecting flange or arms of the cross section does not exceed three-quarters of an inch in thickness. The thickness of the fireproof covering on all surfaces measuring more than three-quarters of an inch wide and measuring in a direction perpendicular to such surfaces shall be not less than that specified for interior columns in the beginning of this section, and all spaces, including channels or chases between the fireproof covering and the metal of the column shall be filled with a solid fireproof material. Lattice or other open columns shall be completely filled with approved cement concrete.

921. (Foundations—Steel In—Concrete Around Bottom of Columns.)—If steel or iron in any form is used as part of a foundation, it shall be thoroughly imbedded in a concrete, the ingredients of which shall be such that, after proper ramming, the interior of the mass will be free from cavities. The steel or iron shall be entirely enveloped in approved cement concrete, and around the exposed external metal surfaces of such foundation there shall be a covering of approved cement concrete not less than four inches thick.

After the bases or base plates and columns have been set in place, both shall be protected from the effects of moisture by a covering of approved cement concrete applied direct to the metal in an unset state, measuring not less than two and one-half inches thick from the extreme projection to the metal, filled solid into all spaces, and forming a continuous concrete mass from the grillage or other foundations to an elevation six feet above the floor level nearest the column base plate or column stool.

922. (Columns—Wiring Clay Tiles On.)—Burnt clay tile column covering shall be secured by winding wire around the columns after the tile has all been set around such columns. The wire shall be securely wound around the tile in such a manner that every tile is crossed at least once by a wire. If iron wire is used it shall be galvanized, and no wire used shall be less than No. 12 gauge.

924. (Pipes Inclosed by Covering.)—Pipes shall not be inclosed in the fireproofing of columns or in the fireproofing of other structural members of any fireproof building, provided, however, gas or electric light conduits not exceeding one inch inside diameter may be inserted in the outer two inches of the fireproof of such structural members.—(*To be continued.*)

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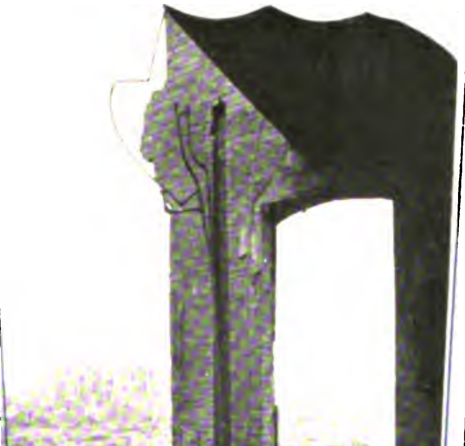

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Vol. 7 JULY, 1905 No. 1

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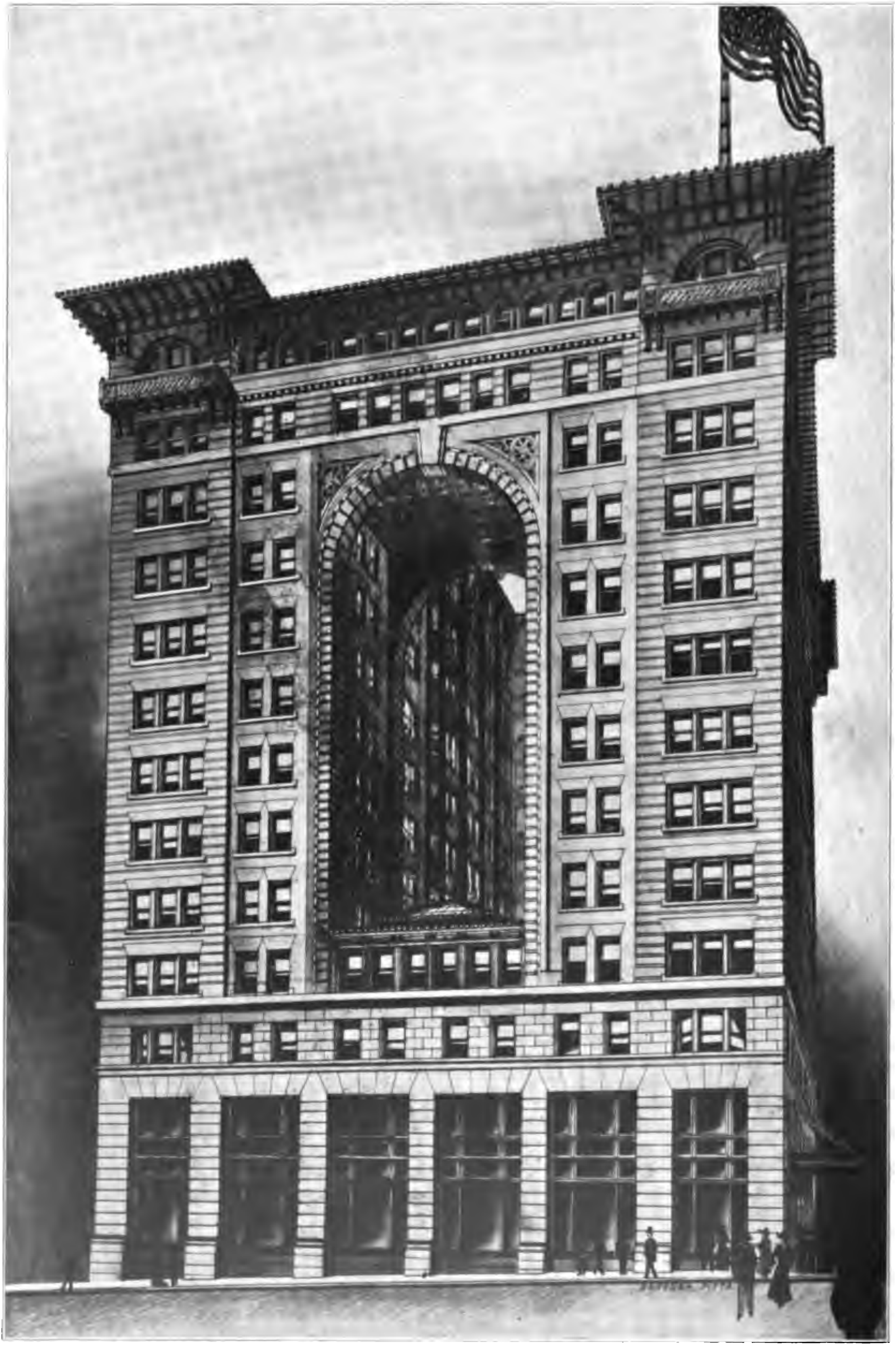

NEW YORK BUILDING, PITTSBURG GROSVENOR ATTERBURY, ARCHITECT.
From the architect's perspective drawing.

FIREPROOF MAGAZINE

Vol. 7. August, 1905 No. 2

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CONVINCING EVIDENCE OF THE VALUE OF HOLLOW TILE FIREPROOFING IN THE BALTIMORE CONFLAGRATION

WE reprint on other pages of this issue from *Engineering Record* an account of the reconstruction of the Continental Trust building, Baltimore, with the original illustrations, for which we are indebted to the courtesy of the publishers of that journal. After all that has been said about the fireproof buildings of that city which went through the conflagration of February 8, 1904, with more or less damage, here is carefully prepared testimony from an unprejudiced source to the efficiency of the hollow burned clay tile fireproofing of the largest, most costly and most recently erected of the group of buildings which so nobly resisted the conflagration. It is full of valuable lessons.

It is only possible to determine the value of fireproofing with accuracy after a building has been completely restored according to the original plan. The Continental Trust building was less than a year old at the time of the conflagration, and it may be assumed that it represented the condition of the art of fireproofing as practiced in Baltimore at that time. There probably are better fireproof buildings elsewhere and many that could better resist an exterior conflagration. There is no doubt that this building could not have been seriously damaged by any fire originating within it, unless the fire were left to do its work without attempt at extinguishment. There is no doubt, also, that notwithstanding that there was practically no fire protection to its windows and other openings, it could never have been damaged as much as it was by a severe fire in any of the adjoining buildings. But in the great conflagration it was enveloped in flames at every opening, which invaded its every room and filled it with fire at once from bottom to top, destroying all its combustible finish and contents above the first story, which furnished the additional fuel to attack its protected structure.

As a result every material that contributed to its erection was subjected to test and much of it to destructive test. It turned out, as this account shows, that its exterior walls and its elaborate inside work sustained the greatest loss, and that, after all, the floor construction and steel frame fire protection sustained the least loss, stated to be only 5 per cent, while the loss to the steel frame, for whose protection the fireproofing was devised.

was only nominal. After that can anyone say that there was any practical failure in the fireproofing? The loss in this, as in all the other high fireproof buildings, was in materials outside of the fireproofing proper, and to which it bore no relation as protector.

The following extracts are especially worthy of repetition and studied attention:

"The exterior granite and terra cotta were very badly injured, and most of the enameled brick facing was loosened, but comparatively little damage was done to the roof and floors, and practically none of the solid brick walls or the steel framework."

"The plaster and tiling had sufficed to protect the steel work from injury by the heat, even in most places where it had been subsequently detached."

"On the exterior of the building the white face brick were greatly damaged by the heat and were useless, being friable and broken."

"The general condition of these floors was considered very good, and wherever repairs were necessary they were made and the floors restored to the original standard."

"When the bottom surface of the arch tiles was gone they still retained so much strength that the floor spans sustained a concentrated test load of 600 pounds of sash weights, without any perceptible deflection or cracks."

"None of the main steel framework of the building was found damaged or needed repairs except three of the floor beams and the light wall channels in the court."

The account of how the floor arches were all given a severe test with a heavy roller before repairs were undertaken is especially interesting. This test did not develop a single defect. The method of making the repairs to the floors is equally interesting, showing that even some of them were taken out which had withstood the roller test. As a result it may be safely said that the building is now in good condition, and, in many respects, better than it was before the fire.

THE PROPER USE OF WIRED GLASS

STOCKTON B. COLT, architect for the Barclay building, New York, which was described and illustrated in our July number, writes asking us to explain why we used the following expression in that article: "The only mistake noticeable is in the use of wired glass in the skylights." In previous sentences the plan, materials and construction had been given unstinted praise as a model of modern fireproofing. We had told how the floors and all interior finish were made incombustible, and how all the windows in the building except those fronting on wide streets were glazed with wire glass, without comment, and, of course, we had a reason for objecting to wired glass in the skylights; and as we did not say why, it seems proper that we should do so now, since our attention has been called tt it.

This magazine has advocated the use of wired glass as a fire retardant ever since its publication commenced, and still hopes to see it extensively applied. But there are instances in which it may be an element of danger if not used with discrimination. The principles which should regulate its use were laid down in a paper which was printed in the first issue of this magazine, July, 1902, p. 47. These were the words used: "The value of wired glass has been referred to. In an office building it will prove to have its greatest value when used in vertical positions where glass is necessary. It should also be used in all external windows wherever possible. But it should always be set in metallic sashes and frames." We might go farther and say that nothing but wired glass, or prism glass, in small quarries set in metallic frames, not soldered, should be used in any vertical openings, whether inside or outside of a building, if it is to be regarded as the best fire risk.

But when it comes to horizontal closures with glass, these materials should not be used in any place where the quick escape of smoke or flame is necessary to protect lives or prevent lateral extension of fire. These instances occur over elevator shafts and in skylights for narrow light shafts. The building laws for many cities require that over elevators there shall be skylights of thin glass, so that the glass will break quickly in case of fire and act as an automatic smoke and fire escape, which all practical firemen consider necessary. They also require that under such skylights there shall be suspended wire nettings sufficient to arrest falling pieces of glass and falling embers that may break through the glass from an exterior fire. This is as it should be. But to combine the glass and wire into one material in such a place makes the glass unbreakable and defeats every object in its use except translucency.

In the case of large skylights over light shafts we do not advise the use of thin glass over the whole area. In such skylights only sections at the highest points should be set with breakable glass having wire nets beneath, of sufficient area to allow the emission of smoke and flame. The main parts of such skylights should be of wired glass. In these opinions we believe we are sustained by the reports of the committee of the National Fire Protection Association and Mr. Edward Atkinson of the Insurance Engineering Experiment Station at Boston.

It is well known that on the occasion of the Iroquois Theater disaster, only one of the two wired glass skylights was blown out by the explosion of carbon monoxide and other gases in the early stages of the fire. Had both of them been destroyed there would have been less loss of life.

THE prospects of the new high-service water system for Chicago do not seem rosy. A public banquet was held on the 9th of June to discuss plans for its promotion, but differences of opinion, not expected, arose. City Comptroller L. E. McGann proposed that a fund be created by levying a special tax on those to be benefited by it, but Alderman F. I. Bennett claimed that this would be illegal. Many eloquent pleas for the installation of the service were made. The Building Managers' Association took advantage of the occasion to urge that, if the high service is installed, many of the improvements in business buildings required by the new building ordinance recently adopted, which would put their owners to expense, ought to be repealed. The whole affair was remarkable rather for the display of self-interest by the various business organizations represented than for any consideration of the interests of the whole community.

FIREPROOF BUILDINGS IN AMERICAN CITIES

MR. H. E. HESS, manager of the New York Fire Insurance Exchange, has issued a circular to its members, in which he purports to show the number of fireproof buildings in twenty-one large cities of this country. He says that it is the result of a correspondence carried on with the local boards or other fire underwriting organizations having jurisdiction in those cities, and that the showing is regarded as of such interest that he has been instructed to publish the list for information. On his authority we give the list, as follows:

Boston	265
Buffalo	86
Chicago	298
Cincinnati	51
Cleveland	48
Detroit	8
Indianapolis	10
Louisville	14
Milwaukee	32
Montreal	35
Newark	45
New Orleans	10
Philadelphia	166
Pittsburg	100
Providence	23
Rochester	46
San Francisco	40
St. Louis	190
Syracuse	6
Toronto	17
Total	1,490
Manhattan and the Bronx	1,389
Brooklyn	113
Jersey City, Hoboken, etc	28
Total	1,530

The main purport of the report, however, as stated by Mr. Hess, is to show that there are more fireproof buildings within the jurisdiction of the exchange which he represents (meaning the combined cities of New York) than in all the rest of the country together. He adds, too, that the list is not complete in the fact that it does not include "a number of fireproof buildings having municipal ownership, such as libraries, schoolhouses, courthouses, etc., of which we have no record, because they are not specifically rated."

As Mr. Hess uses only the word "fireproof," and not the newly coined words "fire-resisting" of the insurance experts, we would be justified in assuming that he intended to be understood literally. But we will not do that, and will let the information go for what it is worth. Being the first statement of the kind thus far made as the result of investigation and extensive and painstaking inquiries, it is valuable. But its accuracy may be questioned when we consider that there are all kinds of so-called "fireproof buildings." The great number said to exist in New York and its neighborhood is a fine showing for that famous city. But when we consider that nearly all the fires that have broken out in the reputed fireproof buildings of the metropolis have been rather disastrous, while there have been scores of fires reported in Chicago's fireproof buildings in which the loss has always been nominal, and in none of which there has been serious destruction, we fear that the New York statistics will have to be taken with some grains of allowance. Chicago will, we think, be satisfied, under all the circumstances, to stand second in the list.

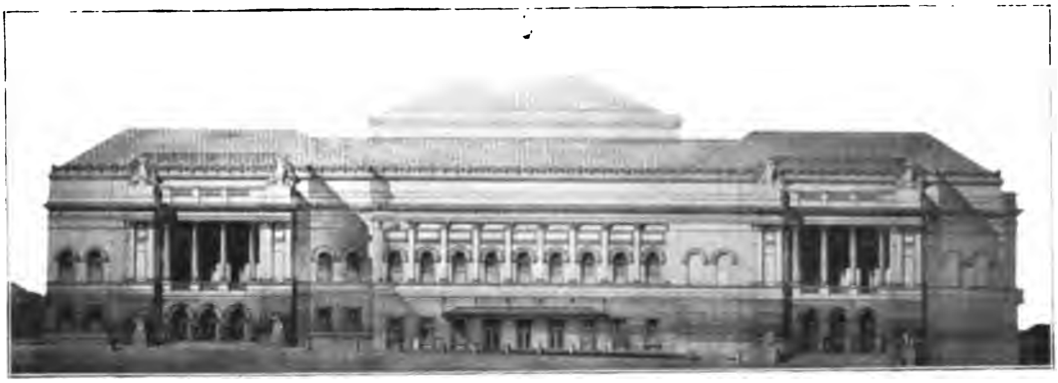


PLATE 1.

THE CARNEGIE INSTITUTE OF PITTSBURG, PA.

BY W. I. PARRY.

ANY attempt to describe in detail the various minor elements entering into the construction of the new Carnegie Institute of Pittsburg, the erection of which is now nearly completed, would require a space far beyond the limits of this article. The aim of the writer will therefore be to give a few general ideas of the main building and accessories as to style of construction, etc.

The ground occupied by the Institute is a part of, or rather a supplement to, Schenley Park, a public pleasure ground which occupies a position in the development of the city of Pittsburg intermediate between the district called Oakland and Shadyside, the latter being usually taken as the beginning of that section of the residential city generally known as the East End and its location will eventually be a very central one, as the rapid development of the city is in the easterly direction.

On a part of the site occupied by the building now in process of erection there was formerly a structure of considerable size, but insignificant in proportion to the new edifice. It was supplemented by a series of branch libraries in the various districts of the city which, by the way, were in most cases small villages or boroughs which have been gradually overtaken and absorbed by the ever-growing city which stands at the gateway of the great middle West.

This original building is therefore the nucleus of the new structure which is to be the heart of the entire system included in the "Institute." Pictures of the old building have been so widely circulated that it is doubtless familiar to most of the readers of these pages. Its dimensions were about 128 feet by 360 feet, and its familiar facade will form a part of one side of the new building. Here, under one roof, were the music hall seating 2,000 people, the art gallery, the library and the museum, with their many anterooms, entrances, etc., and numerous rooms for lecture, exhibition and executive purposes.

This building was erected in 1894 and was then considered of very large proportions, but, in spite of its immensity, it was soon found too small for the wide scope of the work contemplated by Mr. Carnegie's munificent gift, and in consequence it became necessary to enlarge its capacity to cover all the various branches of teaching that have developed from the original idea of library, museum, music hall and art gallery. The result is a very much larger building which has absorbed

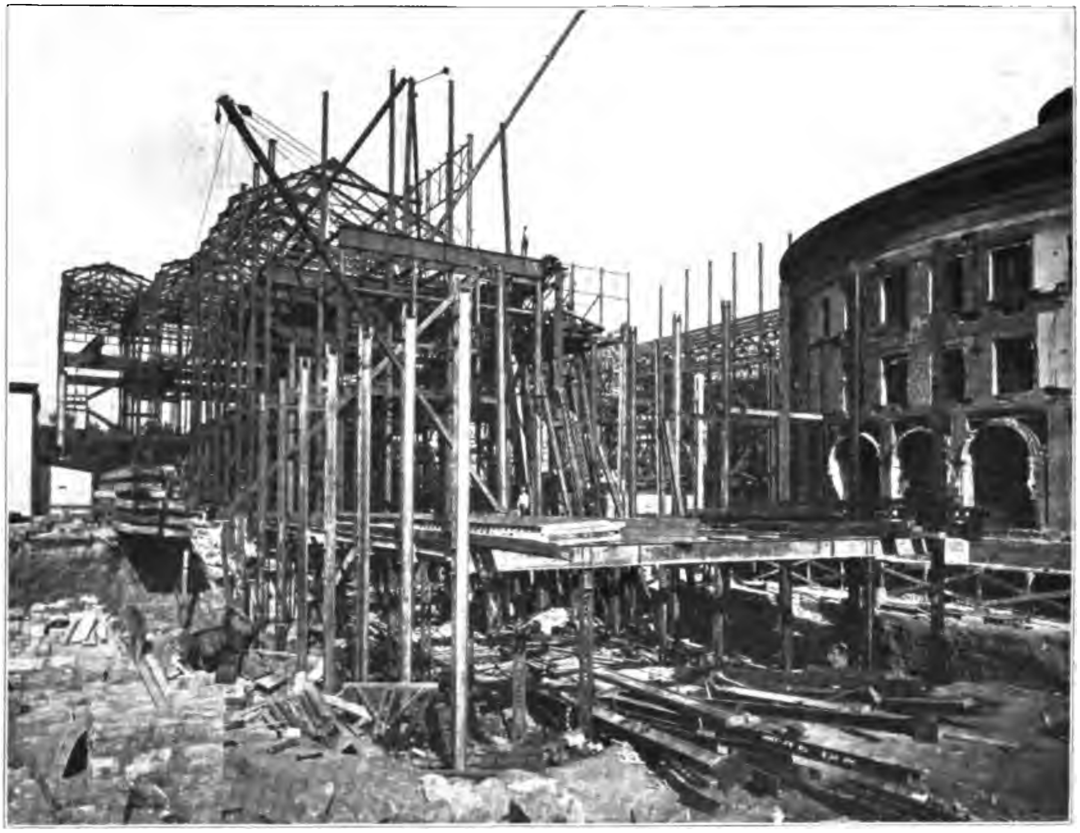


PLATE 2.

the old one in its general design rather than being an addition.

The complete elevation shown by the plate marked No. 1 is from a photograph taken from a drawing of the architects and shows the new facade of the building facing on Forbes street, which is one of the main thoroughfares between the congested city and the East End. This picture gives but a general idea of the quiet and beautiful dignity of the facade. Its style, the Italian renaissance, corresponds in a general way to that of the original building. The width of this front measures about 425 feet, which will give some idea of the proportions of the building, the complete outside dimensions of which are about 428 feet by 565 feet.

The old building, although now a part of the new, remains nearly intact, with the exception that the two towers, which were such familiar and conspicuous features in the old construction, are removed and the old foyer and porte cochere on the Forbes street side of the building in front of the music hall are also taken away, their old place after their removal being shown in the plate marked No. 3. In their stead a new and magnificent foyer will be substituted. This foyer will be quite a feature in the new construction, being as large, if not larger, than the entire music hall itself.

Plate '2, which shows the steel work now erected at the Forbes street end of the building, does not show the rather interesting style of construction to be used at this point, which has not yet been erected, namely, the cantilever trusses which will carry the roof of the new building over the present roof of the curved end of the music hall. The reason for this rather original treatment was, primarily, to avoid any interruption of the use of the music hall

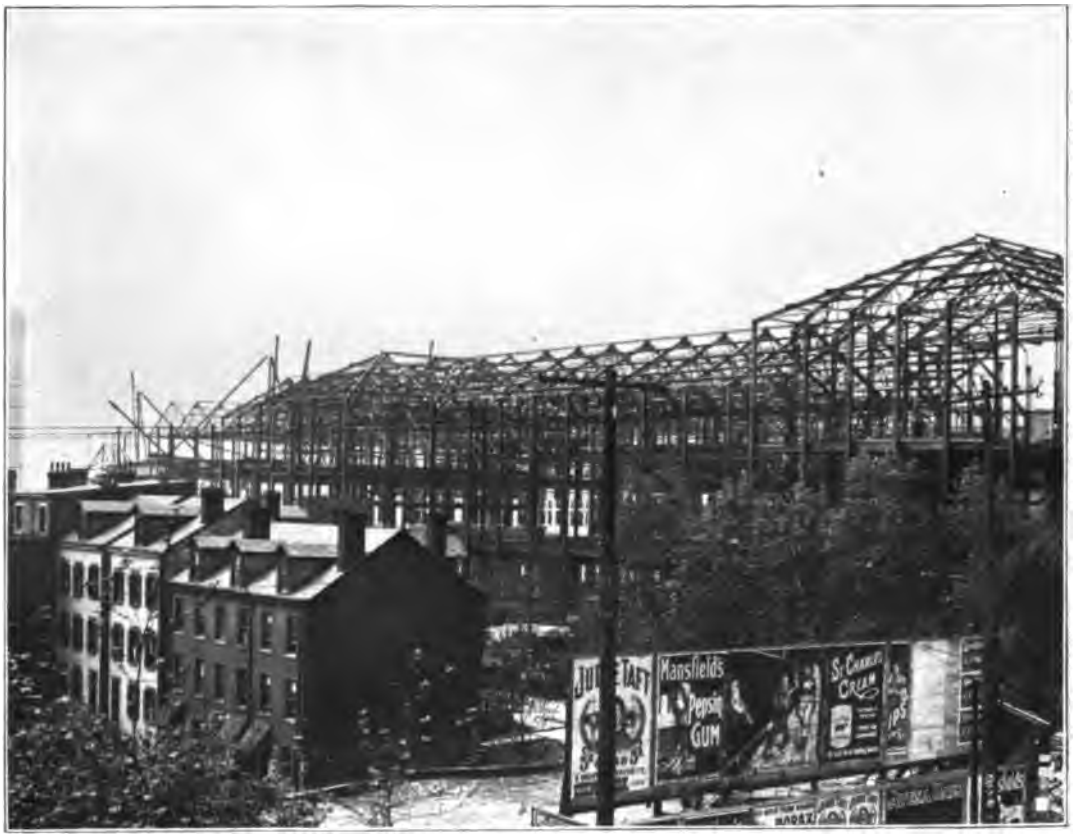


PLATE 3.

during the erection of the new building, but, in addition to this, there was the fear that any alteration in the present building might disturb its acoustic properties, which now seem to admirably meet the requirements, the science of acoustics seeming to be so little understood that many buildings which have these qualities to a successful degree often apparently owe them merely to a happy chance. The result of this cantilever construction will be that the interior roof effect of the new building will remain the same as that of the old, without any exterior evidence of the former apse-like end of the construction, although the old roof tile will remain undisturbed.

This photograph shows the general style of construction employed in the new building. Although the exterior effect is that of one huge building, still it might better be styled a collection of separate buildings, including the halls of architecture, sculpture, geology, paleontology, osteology, mammals, botany, bronzes, etc. It will be observed that the whole construction suggests the steel frame type, or, perhaps more correctly, the steel shop or mill type, with columns to carry floors and trusses, entirely independent of the walls, leaving the walls the simple duty of carrying themselves and thus relieving them of the responsibilities usually belonging to them in a building of this character. The columns generally rest on beam grillage foundations and the entire steel frame is made independent of the wall construction by a method similar to that ordinarily used in the skeleton type of office building. In a way this type of construction is rather unusual for buildings of the monumental class designed for public use. As a matter of fact, however, it would seem, when viewed with the true spirit of architectural design, to be the absolutely correct con-

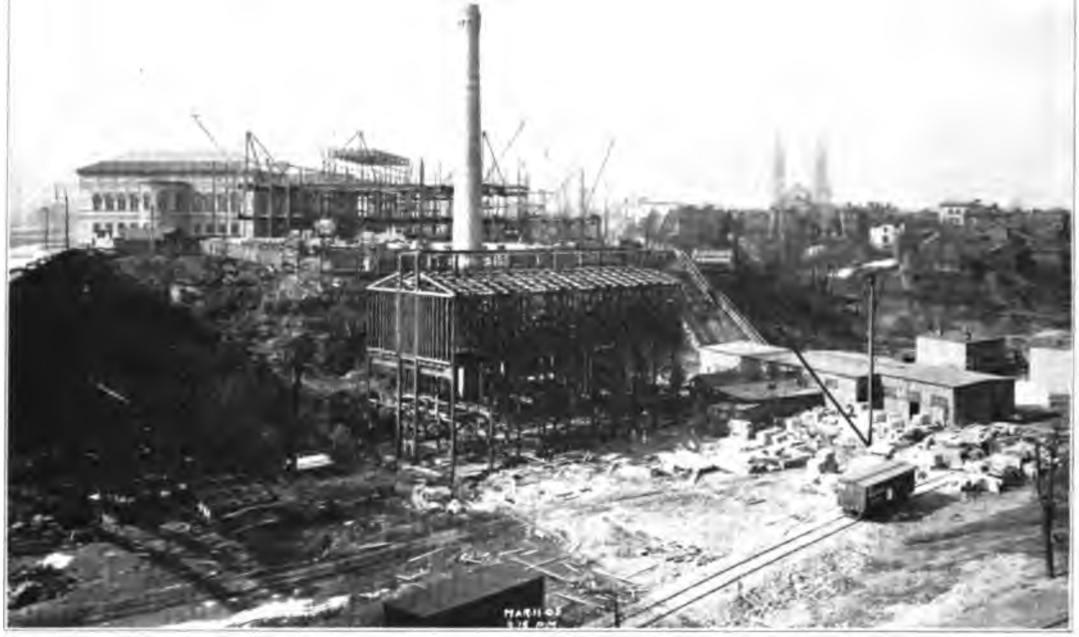


PLATE 4.

struction, based upon the fundamental principle of first securing the construction and then following with the ornamental or architectural effect. In doing this the actual loads and the position of the resultants of the loading are determined, located and provided for without uncertainty and then the architectural treatment can be made independently, with aboslute freedom in design, making the walls and piers harmonize, of course, with the constructive features, so that fitness and utility for their apparent work is indicated, this being undoubtedly a true and fundamental principle in all artistic design. The exterior walls of the entire building are faced with Amherst (Ohio) sandstone, similar to that of the original building, thus giving a complete and imposing effect and a unity in character.

The floors throughout are of the regular standard type of steel fireproof construction with beams spaced about five feet on centers and terra cotta arches of the standard end construction type, practically two sizes of arches (9 and 12 inches) being used throughout. These were furnished by the National Fireproofing Company.

The plate marked No. 3 shows part of the steel construction in place on the Mawhinney street side looking from Forbes street toward the glen or hollow to the rear, the chimney of the power house showing in the rear to the left of the picture. This view gives a general idea of the steel construction used and its ordinary characteristics. The plate marked No. 4 is from a photograph taken from the rear of the building looking toward Forbes street, the building itself being upon a plateau flanked on two sides by a glen or depression called Panther Hollow, on the other side of which Schenley Park

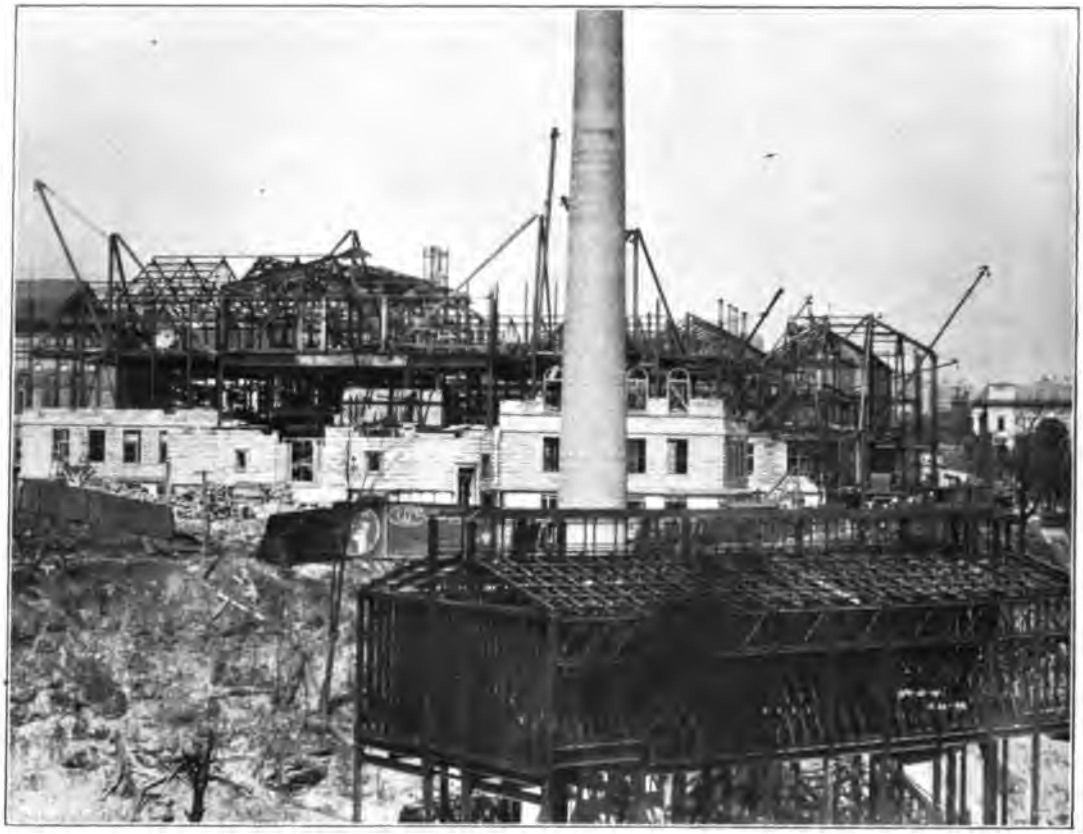


PLATE 5.

may be said to begin. On the left of this picture may be seen a part of the original building, with the steel frame and some of the masonry of the new adjacent to it also slightly showing; the part of the steel frame immediately on the left of the chimney or stack projecting above the rest of the building is the new Book Stack building, which will be probably one of the largest and most complete book stacks ever built, which will have a total capacity of 1,000,000 volumes. The building in the foreground in front of the chimney is the new power and boiler house, only the steel frame of which is shown in the photograph. This structure stands in the glen below the level of the main building and will be entirely fireproof. The upper part, as shown, consists of four coal hoppers with a total capacity of about 3,000 tons, and an ash hopper at the end toward the reader with a capacity of about 800 tons, all the hoppers being fed by an endless chain system of buckets. The boilers are situated under the coal hoppers and fed from above, discharging their ashes below into ash holes, from which they are carried by this power transmitter up to the ash hopper, which again transfers them to the cars for removal. The power house measures about 63 feet by 147 feet. Its steel frame was designed by the writer of this article.

In the distance, on the right background of this last picture, may be seen the spires and facade of the new Roman Catholic Cathedral, now nearing completion, of which all Pittsburgers are so justly proud and which is a very conspicuous object from all points in this part of the city.

The frame building in the hollow near the power house is the stone shop of the builders, where the carving, planing and dressing is being done, the raw stone being received and handled in the hollow, cut and dressed and carried up to the building level by the inclined plane which can also be seen at the rear of the shed in the picture, so that the principle of what is called in Pittsburg the "straight-line shop" is maintained; that is, the raw material comes in at one end of the shop and, progressing constantly forward, it leaves the other end as finished material.

Plate No. 5 shows a closer view of the power house frame and stack and also gives a slightly more advanced view of the stonework of the new building, with just a glimpse of the old building at the extreme left of the picture.

With these pictures and their description, the reader can form some idea of this building and its size, but perhaps a few figures will still further help to form a clear idea of its magnitude. The steel structural material, furnished by the Carnegie Steel Company, which was used in the buling itself, exclusive of the power house, weighed 5,619 tons; the frame of the power house complete will require 834 tons, making the total weight of all structural steel required 6,453 tons.

It will, of course, be understood that this institute is entirely outside of the new technical schools now in course of erection in the same neighborhood. This is an entirely distinct and separate undertaking on different lines and is directed more toward practical or technical education or development.

The architects of the Institute buildings are Alden & Harlow, who were also the architects of the original building, and who have been particularly prominent in the architectural design of the larger buildings in this section, notably the Carnegie office building and Farmers' Deposit Bank building, the latter of which is twenty-four stories and one of the highest in this country. The contractors were William Miller & Sons Company of Pittsburg. The steel structural work, exclusive of the power house, was designed by Charles Worthington, also of Pittsburg.

CEMENT AGE CALLS A HALT ON BAD CONCRETE FIREPROOFING

THE following significant article appeared in the *Cement Age* for May. The reasons behind it are obvious. The time had come for the advocate of all kinds of concrete fireproofing to not only recognize the disastrous effects on the cement trade of numerous failures of so-called reinforced concrete fireproofing, but to condemn the frantic way in which it has been puffed up, without discrimination, by certain fire insurance experts, civil engineers, architects and publishers of popular newspapers. Had this article been offered to FIREPROOF MAGAZINE we would have gladly published it, and prove our earnestness by now reprinting it. We are not aware of what building is referred to in the article, but it does not matter. We have consistently condemned all kinds of bad concrete fireproofing, especially the kind which is cheapened by dilution with cinders instead of gravel, slag and other well-known diluents which do not detract from its strength and fire-resisting qualities; and we will continue to do so. We have also recognized the value of high-class reinforced concrete, and whenever we are convinced that it is more reliable and more economical than the best clay products in combination with rolled steel, will be glad to advocate its use:

"The cause of reinforced concrete construction would seem to stand in danger of being damned, not by faint praise, but by too much praise. Some warm admirers of this system of construction have rushed into print with articles attributing to concrete every virtue which it is possible for a building material to possess. They have gone so far that one may question whether their motives have always been disinterested.

"Now, reinforced concrete construction is possessed of a great many substantial virtues, and it is without many of the defects of its various rivals, but it is not a method of building which is fool-proof. The recent harsh criticisms which have been made of a large reinforced concrete building which has been finished lately, while grossly exaggerated, have, unfortunately, a certain basis in truth. We have made a somewhat careful investigation of the facts in regard to this building, and we find that the engineering work on it left nothing to be desired. The contractors, good men, but absolutely without knowledge of concrete construction, were evidently imbued with the idea that anybody could build a satisfactory concrete building; that knowledge and experience were not essential; that the engineers' plans for reinforcement need only to be followed in a general way, and that the result in any case was sure to be a perfect structure. No contractor in his senses would dare to depart from the detailed drawing of the engineer were he constructing a bridge, and it is indeed to the credit of the concrete construction that the divergencies made in this particular case amounted to nothing more than cause for vexatious delays and small additional expense for some alterations.

"While good reinforced concrete construction leaves nothing to be desired in strength, absolute perfection of fireproofing and durability, poor concrete construction has in it elements of serious danger. Those very qualities of monolithic construction and massive weight which add so much to the strength of the well-built structure become a menace in the case of the poorly built one. The temptation to the contractor who has taken a concrete job on a lump sum basis to save a trifle here and a trifle there is a most insidious one. It is well-nigh impossible for even the most expert and thorough engineering inspection to detect these savings. It is easy for the contractor to reason himself into the belief that the little saving which he plans, and which means to him the difference between profit and loss, will not affect the ultimate strength and safety of the structure.

"It is not for the *Cement Age* to point out a panacea for this anticipated evil, but it does seem to be within the province of a paper standing for the cement industry, both manufacturers and consumers, to indicate that concrete construction should be done on some basis that is a protection to the architect, engineer, contractor and the owner, and this might be accomplished to the best advantage by applying to concrete construction the same methods that have recently been applied to general contracting by a number of large firms, viz.: The basis of cost-plus-a-fixed-sum for profit to the contractor. In such case, the contractor has no interest to save any cement or any labor, and the owner gets all the advantages of the utilization of sand or gravel upon his property, even were this utilization not contemplated at the time the contract was let.

"Some plan of this kind will certainly act as a solution of a difficult problem of reinforced and other concrete construction, and this paper feels that in drawing attention to the art and the difficulties governing it, it is only bringing before the public that which the public ought to know and understand."

ARCHITECTS AND FIRE UNDERWRITERS

BY GEORGE E. WALSH.

The attitude of the insurance underwriters toward fireproof buildings of the better class must to a large extent determine the future development of this movement, for in addition to the personal safety of the individual, the owner of a house considers the question of insurance rates. The insurance companies have been charged in the past with a desire to limit the extension of the movement so far as it affects the reduction of premium rates, for in the long run it has been intimated that they would lose more than they would gain. Like many other half-stated truths, this contains only a very small grain of the actual facts, and the exact attitude of the underwriters should be fully understood by those interested in the noble work of encouraging the construction of fireproof buildings. A good many architects are far from appreciating accurately the attitude of the insurance underwriters, and they stand between the public and the builders in a great many instances.

Recently the writer was in the office of an architect of good standing, when his client, after a long discussion on minor details of a new building, pertinently asked, "How much in insurance premiums will I save if the building is made thoroughly fireproof?" The architect, with a smile answered, "About enough to pay for your year's supply in matches." To the further question of his client, the architect continued: "The insurance companies are not encouraging us to build fireproof structures. They don't want them if it is going to cut down their insurance premiums. They would rather leave matters as they stand and take their losses, increasing premiums until they can make money. Understand, they don't encourage the building of old firetraps, but they do not admit that it is possible to build structures so proof against fire that it will warrant them in materially reducing premiums."

I have heard similar views expressed by others, some builders of local reputation, and others business men and shrewd financiers, and a few architects. It naturally leads one to inquire whether there is an understanding among the insurance companies which frowns upon any development of the building trade which tends to reduce premiums. It would even seem as if there was a combination among some architects, too, against the development of the modern fireproof movement. A good many show a lamentable amount of ignorance in regard to fireproofing matters, and they content themselves with clinging to old methods of constructing buildings with brick exterior and wood interior construction, without a single thought of the momentous changes that have come into their profession.

As a matter of fact the insurance underwriters are far more in sympathy with the fireproof movement than many architects, and they are strictly up-to-date in their views in regard to the same. Their attitude toward the whole question is simply one of dollars and cents. It is absurd to imagine that if fire losses through improved methods of building could be reduced 20 per cent, that the companies should consider it unwise to reduce insurance premiums 10 or more per cent. The insurance rates are made high or low, according to the nature of the risk.

Now, from an insurance point of view, a fire risk depends upon a great number of interdependent questions and conditions. The householder who thinks that he has accomplished all that is possible after he has erected a fireproof house of the best grade makes a great mistake. The insurance companies consider his immediate surroundings. A small fireproof residence built directly between two wooden firetraps is still in danger. No insurance company considers the fire risk eliminated. To make the protection sure the owner should induce his neighbors to tear down their old firetraps and erect similarly high-grade fireproof structures. The danger from fire from outside is fully as much as from inside. An isolated country home of fireproof clay tiles and terra cotta is a far better insurance risk, even though far removed from any fire hydrant or fire company, than another similar house built in a block that is notoriously risky.

There was recently built in New York a block of fireproof houses in place of old two-story brick buildings, and the insurance rates were almost cut in two as a result. The insurance companies competed with each other to write risks on the houses, for they were considered ideally safe from conflagration from outside and inside.

Another point which insurance underwriters consider, and which is often overlooked by both owner and architect, is the peculiar tendency of some to construct fireproof walls, and possibly partitions, and then ruin all by giving an artistic finish of a wooden roof, wooden piazza, or some additional wing or bay window. Now, of all absurd things in this world, the construction of a fireproof house up to a certain point, and then a sudden change to inflammable material, appears to the writer about the limit. It looks as if the builder had suddenly lost faith in his work, or had fallen upon hard times and was reduced to accepting second-hand building material for finishing his work.

Yet it is one of those queer illustrations of the human mind to cling to past ideals and methods of doing things. It is hard for some to abandon wood for building purposes, and so they make concessions to the new movement by building fireproof walls and adding wood roofs and piazzas. The result is the fire insurance companies refuse to consider reductions in premiums. The surprised owner argues and explains, vainly trying to demonstrate that his house is fireproof, or at least semi-fireproof. But it is neither. It is doubtful if it would withstand a fire much better than a building made entirely of wood.

A building is either fireproof or not fireproof from the point of view of the insurance underwriters. In the past they have been deceived so many times by so-called fireproof buildings that they are slow to accept risks at any reduction from the prevailing rates. It is natural that they should take this attitude. When the early office buildings in New York were first put up insurance rates were cut drastically, and the saving in a twenty-story building was enormous. A few fires in them caused such heavy damages that the insurance companies raised their rates and showed a skeptical attitude toward buildings of this character. Even the installation of special fire-fighting apparatus and pumps in the tall buildings failed to secure special concessions from the underwriters.

But conditions have changed materially since then. The fireproof question has been reduced to an exact science. Severe tests have been made with building materials under the supervision of experts appointed by the underwriters, and they no longer accept the reports of builders in using doubtful materials. The city building laws may be lax in their specification of building materials, but the rules and demands of the insurance underwriters are rigid and exact. No semi-fireproof building is accepted by them as worthy of reduced insurance rates. Since the Baltimore fire a good many have claimed that the value of many building materials was demonstrated for the first time, but, in fact, it merely emphasized a lesson known to the few, that only burned clay, concrete and wire glass were absolutely fireproof. The insurance underwriters knew this before Baltimore's catastrophe, and they had shown their appreciation of it by refusing to make lower insurance rates on buildings that were not constructed chiefly, if not entirely, of these materials.

To come back to first principles, it may be asserted with confidence that insurance underwriters are in sympathy with the present movement of fireproofing modern buildings, and that the companies are willing and anxious to reduce fire rates where conditions justify it. Their attitude is one of self-protection, and as a consequence they insist upon rigid tests and application of certain well-defined rules in building. They refuse to accept any substitutes for building materials already tested by them unless they can show an equally high resisting quality. In particular, they show a hostile attitude toward the "hybrid" building, which is built partly of fireproof clay and partly of combustible material. They demonstrate an unfailing condemnation of semi-fireproof office buildings, where steel skeletons carry the load with handsome marble or granite fronts, but with inadequate protection to the iron or steel columns and girders. They frown their disapproval when a man builds himself a country home of fireproof clay and terra cotta, and then tops it off with a shingle roof, and later as an afterthought builds a pretty wing or back extension of wood.

Just at present there is quite a tendency in the country to build homes of this latter type. It is a matter of common observation to find country houses of considerable pretension to style and comfort constructed of fireproof burned tile, terra cotta, brick or concrete blocks, with a shingled roof and wooden piazza. In no sense of the word are they fireproof, and should a fire once start inside or outside, they would be swept out of existence almost as easily as one of common bricks or frame construction. The reason for such houses is ignorance, pure and simple, on the part of architect and householder, or a slavish devotion to style and pretension at the expense of personal safety.

One of the worst charges that can be brought against a certain class of architects who design country residences is that they are willing to sacrifice every consideration for style and appearances. They do not advise their clients to construct their homes of fireproof materials because they have not been accustomed to draw up plans of houses of the prevailing popular type in tiles or burned bricks. Wood lends itself to exterior ornamentation which they deem the most fashionable. The sacrifice of life and property for effect is thus carried on annually through a prejudiced ignorance and wilful neglect of modern improvements.

The need of the day in architectural circles is a more comprehensive study of the adaptation of ornamental tiles and fireproof material to exterior residences. The danger of monotony of outline of walls and roof may be responsible for many architects' failure to recommend a form of building which will be fireproof. Effect is after all a strong factor in our architectural development. Simplicity of outline is not always appreciated, and the resort to gingerbread ornamentation is always characteristic of certain classes. In the best architectural circles a simplicity of design and construction is rapidly gaining ascendency, and whether built of bricks, tiles or wood, houses of this character are rapidly increasing.

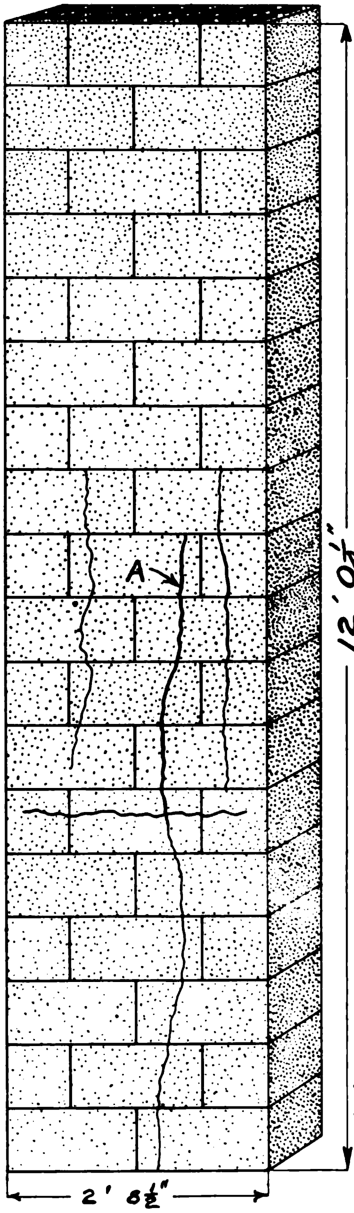
The manufacturers of fireproof tiles and bricks have sought to meet the architects more than half way, and the variety of blocks and briquettes for exterior designs gives the architects a selection broad enough to answer all legitimate purposes. It is, however, essential that a proper conception of the meaning of "fireproof buildings" should be understood by architect and client. It is only by eliminating the impossible "hybrid" houses, with their fireproof walls and flimsy shingled roofs and frame partitions, that insurance rates can be beneficially affected in the interests of householders.

After all has been said, there may be some foundation to the charge that insurance companies have not moved as readily as desirable toward the reduction of rates to meet the new fireproof movement. A little more encouragement in this direction would be highly appreciated. A sharp discrimination between absolutely fireproof houses and "fake" or semi-fireproof houses, by the insurance companies, would tend toward a more thorough enlightenment of the public. If a man knows that his insurance rates are going to be reduced by nearly one-half, he will consider twice before building an old-style firetrap of a dwelling. The classification of risks according to the character of the buildings insured would thus prove a great benefit to all. Let the companies specify in their policies the particular requirements of lower insurance risks. It would not require many paragraphs to indicate to policyholders what the insurance experts considered fireproof houses, and such an innovation would add mightily to the spread of the movement. It would lessen losses by fires within a few years in a most appreciable way, and in the end make money for the insurance companies. It is possible for the latter to earn more profits at lower premiums and fewer great losses than to charge present high rates and make provision for disastrous conflagrations every few years, which wipe out all that has been made in a dozen years, and in some cases bankrupt small companies.

[A few years ago FIREPROOF MAGAZINE would have hesitated before publishing the above article. But we are beginning to think that the indifference of fire underwriters to improvements in fire-resisting methods of building has come to an end. They have been slow in learning the lesson, but now that they are awake to the necessity for recognizing and encouraging fireproofing systems and the abolition of combustible finish for the interior of buildings, we are glad to announce the fact. The opinions above given are from a disinterested expert and shrewd observer of the conditions in the building business which obtain to-day. We have at times been rather severe in criticizing the methods of fire underwriters, and feel that we have been justified in so doing. But we bear them no malice. Whatever we have said in this direction has always been with the hope that well-merited criticism might be fruitful of good results, not only in awakening some people to a full realization of the responsibilities to the community which their calling involves, but to their clients and patrons as well. One matter to which we have heretofore called the public's attention is that in some states there is not enough available insurance "to go around." That is, that some large establishments which look to fire insurance for their main protection cannot get enough policies to cover their prospective losses. This is beginning to be appreciated more and more every day, and it is so important that it has been made the subject of the leading article in *Insurance Engineering* for July. Among the remedies pointed out in that journal is the necessity for a larger adoption of fireproof methods in the construction of buildings.—Ed.]

National Fire Proofing Company.
Testing Station, Chicago.

NUMBER OF ARTICLE	WHEN MADE	WHEN TESTED	FIRST SERIOUS CRACK	MAXIMUM PRESSURE	SQUARE INCHES BEARING SURFACE	STRENGTH PER SQUARE INCH
433	8/11-04	11/18-04	84 TONS	84 TONS	101	1663.4 *



Partition Tested.

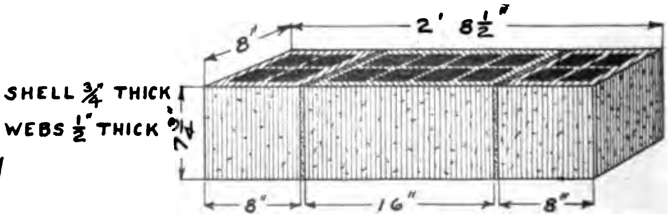
TEST

TONS	COMPRESSION
10	——
20	3/64"
10	RECOVERS FULLY
30	3/64"
10	RECOVERS FULLY
40	3/64"
10	RECOVERS FULLY
50	5/64"
10	RECOVERS WITHIN 1/32"
60	3/32"
10	RECOVERS WITHIN 1/32"

NO SOUND WAS GIVEN OFF UNTIL 50 TONS WAS REACHED. AT 55 TONS THERE WAS A VERY FAINT SOUND, AND AT 70 TONS A LOUD REPORT. CLOSE INSPECTION SHOWED NO INDICATION OF INTERNAL FAILURE. A SIMILAR REPORT AT 75 TONS WHEN CRACK "A" APPEARED. THE PRESSURE WAS STEADILY RUN UP TO 84 TONS, THE MAXIMUM. RUPTURED WALL STOOD AT 5 TONS OVER NIGHT AND NEXT A. M. PRESSURE WAS INCREASED TO 40 TONS AND A PHOTOGRAPH TAKEN. FAILURE BECAUSE INTERNAL WEBS DID NOT COME OVER ONE ANOTHER.

CONSTRUCTION

WALL BUILT OF BLACK, GLAZED, HARD-BURNED, HOLLOW TILE. THE ONLY DISCRIMINATION IN SELECTING THIS TILE WAS TO GET THOSE WITH SQUARE SURFACES. TILE WERE LAID IN "GOOD BRICK MORTAR" TO WHICH A LITTLE PORTLAND CEMENT HAD BEEN ADDED.



Detail of One Course.

Test of 8" Glazed, End-Pressure Tile Partition.

TEST SHEET NO. 9.

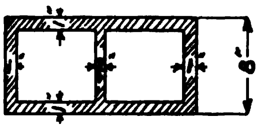
W H Roney C.E.

National Fire Proofing Company.
Testing Station. Chicago.

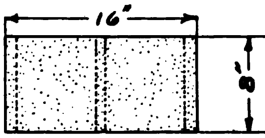
NUMBER OF ARTICLE	WHEN TESTED	AREA IN COMPRESSION	MAXIMUM LOAD	ULTIMATE STRENGTH PER SQUARE INCH
A 55	5/19 - 05	48.5 □"	200 TONS	8247 *

TILE TESTED WAS A VERY GOOD PIECE OF HARD BURNED GLAZED TILE, APPARANTLY FREE FROM CRACKS OR DEFECTS.

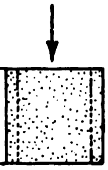
AT 200 TONS BLOCK FAILED ALMOST UNIFORMLY, SPLITTING IN VERTICAL SEAMS. NOT A WHOLE WEB LEFT.



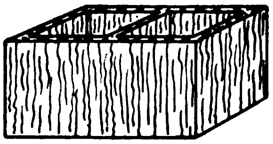
Top View.



Side View.



End View.



Perspective View showing failure cracks.

TEST

LOAD		
25	TONS –	O.K.
30	"	" FAINT SOUNDS
35	"	"
40	"	" SLIGHT SOUNDS
45	"	" "
50	"	" "
60	"	NO SOUNDS
70	"	LOST 3 TONS ON GAUGE. PLASTER JOINTS [SEEM TOO SOFT.
75	"	O.K.
85	"	"
90	"	LOST 5 TONS ON GAUGE.
100	"	SOUNDS
105	"	" & PLASTER PEELING OFF.
110	"	" SHARPER.
115	"	" "
120	"	" ABOUT SAME.
125	"	
130	"	SHARP SOUNDS
145	"	HOLDS LOAD
150	"	DISTINCT SOUNDS
155	"	" " LOUDER
160	"	
165	"	SHARPER SOUNDS
170	"	" "
175	"	" "
180	"	" "
185	"	
190	"	FAILING
195	"	"
200	"	FAILED BY CRUSHING ON ALL SIDES.

Test of Hard Burned, Glazed, Hollow Tile.

TEST SHEET NO. 10. A. F. OWEN. DEL. W H Roney C.E.

CURRENT OPINION FROM VARIOUS SOURCES

ANNUAL FIRE LOSSES

(From San Francisco *Call.*)

Fireproof building is shown by the terrible figures of last year's losses to be one of the most needed things to which the attention of the public can be called. The losses by fire have been severe in this country for many years back, but last year the statistics show they footed up such an enormous destruction of property and life that the press would be justified in spreading the news, with all the emphasis at its command, as if some big national firebell rang out an alarm.

We burn up a million and a half of property every day, and eighteen deaths per day result from these disasters. As a writer in *Public Opinion* has condensed the figures of the experience of past years, we burn up, or seriously damage every week, three theaters, three public halls, twelve churches, ten schoolhouses, two hospitals, two asylums, two colleges, two jails and twenty-six hotels. This was an estiamte previous to last year, and we can only look upon those figures as an approximation of the average destruction which is going on now.

The sting of this presentation of facts lies in the knowledge that almost all of this waste of wealth and life is preventable. The public should take a keen interest in the matter, because they have it in their power to hasten the time of general fireproof construction. It is not a matter for insurance companies, municipal governments and building contractors only; tenants should persistently object to renting inflammable dwellings, apartment houses and places for their offices, and wherever possible the people should emphasize their preference for living in houses and in neighborhoods where proper fireproofing has been made a feature of construction.

It has been estimated that the cost of building in a way to be safe from fire is only 10 per cent more than the risk-taking method, and that the good building deteriorates only one-ninth of 1 per cent per year compared to the 4 per cent of the ordinary building. Such structures rent better, and the banks will lend money on them on better terms. Perhaps even more than the loss of property, the deaths of human beings and their injury deserve consideration. A thing worthy of note, too, but difficult to calculate the amount of, is the loss of happiness and content of mind from the continual danger to life and property caused by inflammable buildings.

Just a few of the more startling figures show that we throw away by fire $14,000,000 in every ten days; that the total new building done in the twenty-three leading cities of the country for the whole month of February was only a little over that sum, namely, $14,225,907; that we burned up that month more than we built, and that the property destroyed would have sufficed to make every new building that was built absolutely fireproof.

A LAW THAT WOULD MAKE FOR THE LESSENING OF THE FIRE HAZARD

From the (*Insurance*) *Chronicle.*

Whoever is responsible for the measure proposing an amendment to the laws of North Carolina with a view to reducing the fire waste of the state—now before the legislature—is entitled to a great deal of credit. The bill deserves to pass, and we hope and believe that it will. So accustomed have we become to hearing of the enactment or proposed enactment in our state legislatures of laws designed to tax and otherwise hamper the operations of individuals and corporations that it is doubly refreshing to learn of a measure the sole purpose of which is to benefit property owners. Such an act is the one above referred to. The bill provides for the appointment by the insurance commissioner of a fire department chief in every city and incorporated town in the state not now having such an officer. In addition to performing the duties common to his office, the fire chief is also to be local inspector of buildings, and must report the result of his labors to the insurance commissioner. The latter official is empowered to enforce the law relative to the investigation of fire waste.

The erection of frame structures within fire limits is prohibited, and the character of material permissible in building is defined, as is also the minimum thickness of walls, the method of placing joists, and so forth. Flues must be cleaned upon the completion of a building, and other equally sensible precautions for the prevention of fire taken.

The enactment of the measure and its faithful observance would largely tend to reduce the fire loss ratio of North Carolina.

THE NEW YORK BUILDING OF PITTSBURG, PA.

BY W. I. PARRY.

ACCOMPANYING this article* is a reproduction of the architect's elevation of the New York building, which is now in process of erection at the corner of Sixth street and Duquesne way, Pittsburg. It is owned by Mr. Henry Phipps of Pittsburg, who recently built the Bessemer building on the opposite side of Sixth street. Both structures are for office purposes and they are of the same height, of similar style, material, color and general effect, and each of them has a frontage on Duquesne way, which runs along the bank of the Allegheny River. This resemblance is particularly noticeable in the unique roof construction of the two buildings. Standing, as they do, on the opposite sides of Sixth street, where that busy thoroughfare terminates in the principal and most traveled bridge to Allegheny, they may well be called the gateway between the twin cities, which is the heart of the steel industry of the United States.

The picture shows the Duquesne way frontage of 130 feet, that on Sixth street being 150 feet. It will be noticed from the elevation that the distinguishing feature of this building is the big archway opening into the interior light well from the street. This light well measures 40 feet in width and 100 feet in length inside of the arched portion of the building. In addition to its novel and pleasing architectural effect, this large archway, which faces the wide river, insures for all time an abundance of light for all interior rooms, and as this opening is on the north front, it secures that "north light" so much desired for rooms in which the lighting is the important feature. This advantage will make these offices particularly desirable for artists, drafting rooms, doctors, dentists, etc., and add much to the renting value of the building.

The location of the building is remarkably convenient, as not more than 10 to 15 minutes' walk will be required to reach almost any point in the busy part of the city. The structure is thirteen stories high, the first four stories being carried up on all four sides and the open archway extending from the top of the fourth story to the bottom of the twelfth story, the light well coming down to the ceiling of the second floor. The first three stories are built of rough-tooled New England granite rock. The exterior walls of the upper stories are of a neatly finished brick of almost the same shade as the stone below and the roof is of a darker, harmonizing color.

Adjoining the building, on Duquesne way, is the new Gayety Theater, also erected for Mr. Phipps. It is built of steel, brick and terra cotta. On fireproof lines this theater building is entirely independent of the office building, with a good-sized alley intervening between them, but they are connected by a bridge, and a broad passage through the New York building from Sixth street serves as the main entrance to the theater. This wide hall or entry is entirely separated from the remainder of the office building by strong partition walls of terra cotta.

One of the chief difficulties in the erection of this building so near the treacherous Allegheny River was the flood danger, which is an important element encountered in all that part of Pittsburg, which lies not over twenty feet above the normal level of the river. During each spring and fall the river rises in twenty-four hours sometimes 20 to 30 feet, with the result that what was intended for a dry basement or cellar becomes a huge cistern of water, sometimes even flooding the first floor if the building happens to be too low for this erratic stream. Much thought was therefore given to this point in designing this building, and experience with the several other buildings which Mr. Phipps has built in this locality led to the adoption of a somewhat novel construction.

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*See frontispiece, page 42.

The method decided upon was the use of concrete in large quantities, the whole cellar being treated not unlike a boat or ship, with sides of concrete designed to resist lateral pressure, both of earth and possible high water. The floor of the cellar, corresponding to the bottom of the boat, is of concrete 36 to 48 inches in thickness, waterproofed with five and six play tar paper. The columns rest on cast-iron bases about 5 feet square, without grillage, except that on the side opposite Duquesne way, where the building abuts on adjoining property, cantilever girders are used under the columns. The columns are of the channel and plate type throughout and their fireproofing is of rather a novel nature, as, on account of conditions in the building, they had to be utilized as the points at which pipes and wires were carried from story to story. In order to prevent the usual disadvantages attending this practice the columns were first entirely encased or furred with terra cotta and practically finished on this line, and then another furring or encasement laid over the pipes and wires outside of the first inclosure, thus insulating the columns and enabling the removal of the outside furring to reach the pipes, etc., if necessary at any time, without disturbing the actual fireproofing of the columns.

The floors throughout are terra cotta arches of the standard end construction type, mainly 12 and 15 inch, the deeper girders projecting below the level of the joist arches. The total weight of the structural material used in this building is about 3,200 net tons. It was rolled and fabricated by the Carnegie Steel Company. The terra cotta furring, partitions and arches were furnished by the National Fireproofing Company. Grosvenor Atterbury of New York City was the architect, and F. A. Burdett, also of New York, was the consulting engineer.

As has been already intimated, this is only one of the several buildings that Mr. Henry Phipps has erected or is about to erect in the Iron and Steel City that gave him his fame and fortune, and in all of them he is still conservative enough to adhere to the standard type of fireproof cage construction, using a steel frame of sufficient strength to carry its loads, terra cotta as its fireproof medium and concrete where it is most appropriate for founding and for retaining walls, which are so generally accepted as the appropriate places for each of these fundamental mediums for good construction.

RAMBLINGS

AMONG ARCHITECTS, FIRE PROTECTION CONVENTIONS, LAWYERS AND EDITORS, WITH GOOD ADVICE TO ALL

BY F. W. FITZPATRICK.

A NEW YORK architect with whom I was chatting the other day made a very pertinent remark whose relevancy may have occurred—though it remained unexpressed—to others as well as to him. Said he: "Now, Fitz, if I were you and believed so little in monolithic concrete floor construction, reinforced cinders and all that sort of thing, I should, of course, abstain from doing anything in that class of work, but likewise would I also abstain from making any comment upon it, keeping the subject alive and before the people, and would by my silence contribute to that mode of construction's innocuous desuetude that all things of inferior degree are sure to fall into." I grant my friend and my readers that silence *is* golden, under certain circumstances. In this case I have been assured time and again that my silence on the subject would be so appreciated that it would be at least triple-plated. But then, that is neither here nor there. All things that are bad do not fall into "innocuous desuetude" of their own weight, and are only shoved into that condition by the herculean efforts of reformers. Bad government and bad all sorts of things flourish like green bay trees, and the more silent the reformers remain the greater the effrontery and larger the profit of the aforesaid votaries of the bad. Where would the cleansing sweep-up of municipal affairs we have gladly noted in St. Louis, Philadelphia, Minneapolis and Milwaukee have originated, and when would it have begun, had Joe Folk and men of that caliber remained silent? And what weight would they even have had, had the press not supported them vociferously? No, cement and concrete have too great possibilities, constitute too splendid a building material to permit it to be damned by ill-use, abuse and misuse by a horde of greedy contractors who have seized upon the theories of a few enthusiastic engineers, made in good faith, to foist upon the public, always willing to listen to an argument of cheapness, systems that *are* cheap in every sense of the word, but likewise criminally hazardous, and that controvene all the principles of good building and tend to undo the good work we who have labored in the behalf of better construction have so zealously carried on in the past twenty-five years. People are easily misled by specious arguments, particularly when, as I say, supported by "cheapness," and even architects, who are supposed to know better, yes, seven out of ten, in the general run of the profession, can be influenced by things said and printed in favor of this or that of the hundred or more so-called systems of concrete construction. The interests represented by these systems are manifold and wealthy, and the amount of money available for their exploitation is surprisingly large, and the resultant literature is spread far and wide. Most people who build do so perhaps but once in their lives, therefore, if the average man be blanished into that form of construction, and repents it, his experience amounts to but little, for the chances are that he will never build again—unless he be forced to by the collapse of his concrete structure—and the next man has *his* lesson to learn all by himself. Hence, it is a duty for those who believe in good construction and have the means of making themselves heard, to raise their voices in favor of sound construction, in disapproval of shams, in the direction of the unsophisticated toward what is right, and protecting them from the snares set for the unwary. That is the province of FIREPROOF MAGAZINE, or one of the important details of its province, and that, likewise, is one of the tasks, self-imposed, if you wish, assumed by one of its humble contributors, and that will be carried on, heaven willing, as long as there is any poor construction carried on or advocated.

Besides saying a thing or two myself, I have had the pleasure in the past few months of quoting in these columns a few statements made by different authorities anent the abuse of concrete construction, the dangers attendant upon its handling by inexpert or scheming builders, etcetera. For a year or so past reinforced concrete exploiters have had much to say about the favorable attitude assumed toward their products by the different boards of underwriters, and occasionally, indeed, they have been able to produce a regulation by those boards that seemed distinctly favorable to concrete in the abstract. I have before me a report of the National Fire Protection Association meeting of May 23 last. This association, of which I have the honor of being a member, is made up of underwriters, waterworks associations, American Institute of Architects, fire prevention associations, fire departments, insurance exchanges and such bodies, and the findings of such an association are certainly worthy of some consideration. Referring to concrete, and without even specifying that it means reinforced concrete, or where the material is placed in great jeopardy, but speaking of the material generally, comprehending foundations, and construction in bulk as well as that of filmlike sheets, it says (the italics and capitals are, of course, mine, but serve to call attention to the parts I desire to *particularly* emphasize): "There is no doubt but that in many cases of the past where expert superintendence was lacking, contractors and their employes have wilfully or ignorantly used concrete containing much less than the proper quantity of cement, and hurried the mixing so that the result has been a construction neither sufficiently strong nor fireproof. THE NATURE OF THE MATERIAL WILL ALWAYS ALLOW SUCH ABUSES, AND BUSINESS COMPETITION WILL ALWAYS PROMPT SOME CONTRACTORS TO TAKE ADVANTAGE OF THAT FACT; FURTHERMORE, SUCH BAD WORK CAN BE SO EASILY COVERED UP THAT ITS DETECTION IS ALMOST IMPOSSIBLE. . . . As previously pointed out, concrete is a material which must, from its nature, be susceptible to much abuse, and in the past that fact, as well as the lack of experience of engineers and builders with it, has led to much misuse of it. . . . "

The committee on cement and concrete then formulates a series of general rules that should be observed in concrete construction where it is deemed expedient to use the latter: " . . . The work should invariably be designed and its entire erection supervised *personally* by engineers of skill and experience in this particular line. All steel members of whatever style should be *imbedded at least two inches* in the concrete, and in the case of important load-carrying members, *three inches*. . . . *No cement work of any kind should be laid in cold weather* without being safely guarded against freezing. This will be disputed, but it is correct beyond reasonable doubt. . . . The kinds of stone permissible (in concrete mixtures) is a matter of some question; while our tests did not demonstrate it, the fact is that limestone and granite, especially in cases where the individual stones are of large size, the breaking and bursting of them under fire has in other tests broken the concrete mass, and these stones are therefore not considered generally as reliable for good concrete. . . . " The members of the committee reporting upon cement were Messrs. E. T. Cairns, F. E. Cabot, C. T. Ingalls, A. G. Patton and J. S. Sewall.

Such statements as these from such bodies as this should receive the very widest publication and serve as a deterrent, a check upon people who are willing to place themselves in the hands of the first incompetent or schemer who approaches them with unctious exhortations to use this or that system, because it is so very cheap, so much cheaper than the recognized, tried and tested mode of real fireproof construction.

* * *

Speaking about maintaining silence upon disagreeable things, my good friends who may be disposed to give me that advice would suffer a very decided change of heart could they go over but a small part of my daily mail. Such a performance would open their eyes very wide indeed to the necessity that exists, if we hope to ever establish building upon a firm basis, to scatter far and wide useful information about how to build, real fireproofing and all the other minutiæ about which the public generally have some rather crude ideas. One little example here is a fair sample of very many letters I receive from intelligent people, but men and women who have had nothing to do with building and have not the slightest idea of what is what—ideal victims for the concrete vendor. This gentleman, a lawyer, and evidently enjoying a good practice, writes that he has decided to build a house that will cost him about $12,000. He has "instructed" his architect to make the exterior of siding and cedar shingle, the interior finish of this and that wood, open stairs of oak, dining-room and sitting-room ceilings of oak beams and beaded boarding, etc.—just about as inflammable a layout as he could possibly devise. He goes on to state that he had been attracted by some statement of mine in a magazine or newspaper anent fireproof construction, a statement that he highly commended, for he believed that more buildings should be made fireproof, and had taken the matter up with his architect, who had finaally confessed his inability to reconcile his client's special requirements of certain woods, etc., with fireproof construction as he, the architect, understood it, and had suggested that his client communicate with me direct. The letter continued that the gentleman had not changed his mind as to the woods he desired to use in exterior and interior finish, but he would be very happy to have me tell him how, preserving those requirements intact, he could make his house absolutely fireproof!! I presume he expected some occultism, an incantation or waving of my magic palms, or that I would advise him to coat all this woodwork with an incorruptible, incombustible, all-preserving magic fluid, and I presume he will be much disgusted when he receives my note advising him to set aside all his wood affairs and build like a sensible man. But it simply goes to show what notions people have. They believe in the thing as an abstract principle, but have no idea how to apply it, nor what it means. He, the average man, is hampered by all sorts of prejudices, his imagination is not fertile, he has been accustomed to shingle and siding and things of that sort from his earliest youth, and to show him a floor made otherwise than of joists and wooden lath and a top flooring, is to befuddle him to a certain extent. He has been worked over, however, and is beginning to have a vague idea that there *is* a fireproof construction different from this wood that he has been accustomed to and he is gradually assuming a receptiveness—and just about that time comes our concrete friend, who tells him that the "fairy-so-and-so system is just the thing, almost as good as steel and tile, and *infinitely* cheaper." And that some of the unwary succumb is evidenced by the number of flimsy, worthless structures going up in our cities, particularly the flashy apartment houses built as cheaply as the law will permit, in order to extort the uttermost returns from those who wish to exist and take the chances as cliff-dwellers.

The task of getting people to adopt new forms is not a hopeless one by any means, but one fraught with discouragements that, however, only tend to make a determined man all the more zealous in the campaign he is waging. There are two ways of battling, one with a bludgeon, a big stick, and the other with mild, diplomatic, but as effective weapons, that leave no unsightly scars. Applying this to fireproofing, I maintain that anything that can be made fireproof, but in the form people are accustomed to with wood, and not costing much more than the latter, is a case of having the battle half won before it is waged. Hence my compliments to the patentee of a non-combustible material that can be made in the same form and to resemble wood siding, roof shingles, turned porch columns, six-panel doors, etc. Asbestos and cement offer endless possibilities in that connection, and it is up to the ingenious to put something on the market that will bear all the earmarks of wood, but that will fool the inflammably inclined by positively declining to burn.

* * *

And yet, if they would only make their concrete strong enough to stand up there would be some consolation as far as fires are concerned, for though the stuff will go absolutely to pieces in case of a conflagration, yet it will not burn nor communicate fire as will wood, and is therefore, faulty as it is, a step, faltering and misdirected, in the right direction. This occurs to me as I think of the splendid opportunities that are so carelessly lost by the real teachers of the people—the press ——to inculcate principles of sound construction when and where they will do the most good. For instance, the *Brickbuilder* and magazines devoted to the best interests of building have lately been advocating fireproof construction, even in houses, and have encouraged that work; competitions have been inaugurated with substantial prizes that should stir up the interest of your architects; then comes along the *Ladies' Home Journal,* that has probably the widest circulation of any domestic journal in the country, or the world, for that matter. Whatever it says, and though it says it as Kipling puts it, "in a refined and innocuous manner, full of nickel-plated sentiments guaranteed to improve the mind, and of Lydia Pinkham-like heart-to-heart talk," it is read, nevertheless, by the women, and they are the ones who influence domestic architecture, whatever we men may think or wish, and what the *Journal* says and does is accepted by nine-tenths of the women as matter of faith—something standard and beyond question. Well, the *Ladies' Home Journal* got into the competition mood and offered very substantial prizes for the best cheap house that could be designed—a $3,000 affair. An elegant opportunity was presented for that journal to demonstrate that even for that low figure a well-built fireproof house could be had; but no, its intelligent judges ordained that wood was the proper caper and the prizes have been awarded to men designing wonderfully dainty structures with beautiful open stairs, beamed ceilings and the other tinder accompaniments that insure the highest rate of insurance and absolute destruction in case of fire, not to mention the ever-present danger to the life and limb of everyone housed within such a building. In none of the designs awarded prizes has the slightest notice been taken of any fire-retarding precautions, let alone fireproof building. In other words, it's a step backward. The sort of pretty tinder-box affair presented by the *Journal* to its readers will be looked upon by those readers as the standard of small house building, and that is what they will want, and what they will clamor for. The deed is done and there is no use weeping over spilt milk, but I respectfully submit that when a journal reaches the position the *Ladies' Home Journal* occupies it may be rated in the class of industries and effort in which "public carriers" are placed, and incurs a certain responsibility vis-a-vis the public which it cannot shirk with a free conscience, and in this case the *Journal* has surely made itself culpably guilty, an accessory before the fact, in encouraging a mode of construction that is not only obsolete, but dangerous. It was criminally negligent in losing the opportunity it had presented to it to demonstrate that the general idea that fireproof construction was costly was erroneous. It could have been a tremendously potent influence in the right direction, and it chose to pander to pernicious precedent, and to its influence may easily be attributed a very considerable percentage of the fires that will occur in domestic buildings. And these form no inconsiderable part in the fires that totalled up last year to something over $230,000,000 waste in property, and nearly seven thousand human lives!

THE BRITISH FIRE PREVENTION COMMITTEE'S NEW TESTING STATION NEAR REGENT'S PARK, LONDON

BY ELLIS MARSLAND, GEN. HON. SECRETARY.

London, June 24, 1905.

THE purpose of the tests undertaken by the British Fire Prevention Committee is to obtain reliable data as to the exact fire resistance of the various materials and systems of construction used in building practice, and to give precise particulars regarding a fire alarm, fire preventive, or fire extinguishing appliances. The tests are of an entirely independent character, arranged on scientific lines, but with full consideration for the practical purpose in view. Absolute reliability is assured, records being taken automatically or by photography.

All reports on tests solely state the bare facts and occurrences, with tables, diagrams and illustrations, and these reports do not contain expressions of opinion.

The general arrangement and direction of the tests are in the hands of the executive who acts in accordance with certain principles laid down after careful study and experiment. The official tests are attended by the members of the council and the members of the committee in rotation, who comprise most of the leading technical officials of our government departments, a number of municipal officers, as well as many civil engineers, surveyors and architects in private practice.

Fire tests with materials and systems of construction and appliances used in ordinary practice, and not subject to proprietary rights, are undertaken from time to time by the executive, as the limited resources of the committee permit.

Considerable importance is rightly attached to such investigations, as the information available regarding the efficiency of the more common forms of fire preventive building construction and appliances is most incomplete.

Parties interested in fire-resisting materials, systems of construction, or appliances, can also apply for tests subject to a scale of charges which varies according to the subject put forward for investigation, and the preparations necessary. These charges are only intended to cover in part or whole the expenses incurred upon the tests. Thus, work subject to proprietary rights can come before the committee for review, and inventors, manufacturers and others are given an opportunity of obtaining official reports as to the efficiency of their specialties at or below the cost involved in such investigations.

In all cases, whether the tests be with proprietary work or not, the actual skilled conduct and supervision of the tests, as also the preparation of the reports by the members, is undertaken voluntarily, no fees of any kind, or even out-of-pocket expenses, being paid by the members of the committee for such services.

The total number of tests, both with general work and that of a proprietary character, conducted by the committee is ninety-one to the date of opening the committee's new testing station. Floors, partitions and doors form the majority of the subjects that have been under inquiry.

Apart from the committee's own tests with work that is not subject to proprietary rights and the tests with proprietary work, the committee at the new testing station will be open to undertake tests for public authorities, and we trust that our municipalities will not be slow to get at the actual facts of fire resistance when making by-laws regarding modern forms of construction.

In the early days of the committee's work there was no attempt to classify or standardise tests, but based upon the committee's experience of the earlier investigations, the International Fire Congress of London in 1903 adopted universal standards for fire resistance for the purpose of classifying work as affording "full," "partial" or "temporary" protection from fire. These standards have been applied to the committee's work since July, 1903, so that any subject under investigation can now be classified according to these universal standards, and inventors and manufacturers requiring tests can attain a classification which should be of great value to them. The classification for floors, partitions and doors is as follows:

Having regard to the unique character of the committee's testing station, it is not surprising that inventors and manufacturers in foreign countries are gradually awakening to the benefits obtainable at the London testing station, and that applications for tests with proprietary work reach the committee from distant sources, the committee's reports being considered the hallmark and passe-partout in question of fire-resistance almost throughout the civilized world. Applications from individuals or firms trading in the United States, France, Germany, Denmark and Switzerland have thus from time to time been dealt with by the committee. On the opening day at the new testing station the floor under review was by a Pittsburg firm, while the two doors tested hailed from Canada.

The new testing station just opened is on ground provided by the Central Electric Supply Company, within easy reach of Baker street station. The location was selected upon the principle that unless the plant was within easy cab drive from Charing Cross it would be impossible to obtain as workers those members of the committee who are best able to conduct the operations, of whom the majority are busy men. Any question of having to catch trains to outlying suburbs, or not being easily available if wanted, while at the testing station, would practically prevent their active cooperation. It would certainly have been far more economical and financially more satisfactory in every respect to have immediately equipped a testing station some twenty-five miles outside of London, and to have had no removal of plants, but from the technical point of view, i. e., that of getting the best available technical advice and supervision gratuitously, the present policy as to location has been adopted as the only possible one, even if involving great expense and much additional anxiety.

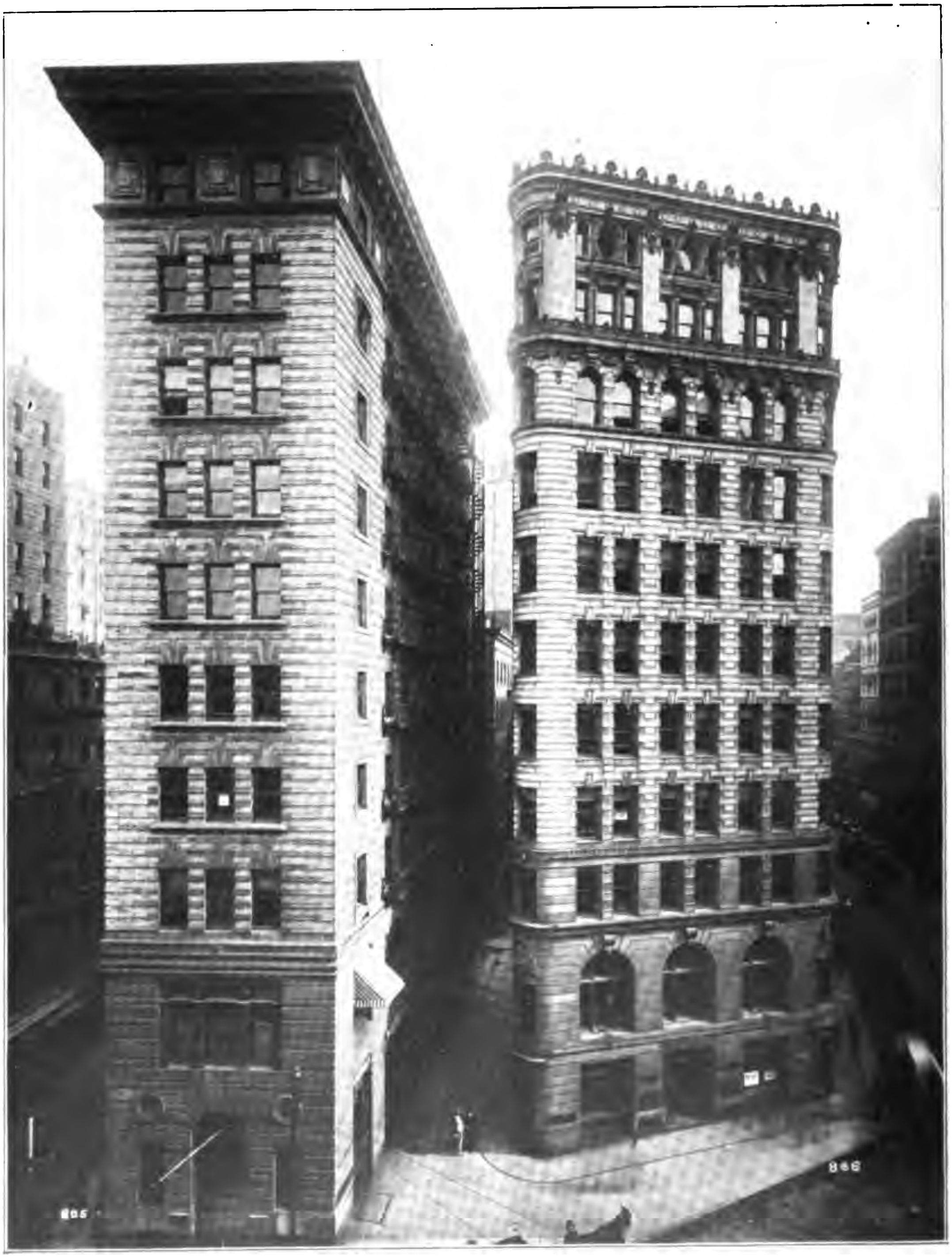
The main plant for testing building materials, systems of construction, etc., comprises a set of testing huts, in which floors, partitions, doors, ceilings, etc., can be tested. The huts are laid down in two rows, their measurements being 20 feet by 10 feet, and 20 feet by 15 feet, respectively. The materials used in their construction are stock bricks and lime mortar. The fuel generally used is gas, produced on the spot by a generator supplied by Messrs. F. W. Mason, Ltd., of Manchester. The gas is conveyed from the generator by pipes to the several huts, and the supply is regulated by valves and dampers, and as the gas enters the huts from the branch pipes it is diffused by means of mixing chambers of fire-brick, as shown. Each hut has door-openings, ventilation and observation holes, the doors being closed by brickwork during a test, and the ventilation holes blocked, according to requirements, by fire-bricks or fire-clay. Each chamber for a floor test allows for the floor under investigation to be placed at least 8 feet above the floor of the hut. The chambers are roofed in with galvanized iron or tarpaulin when necessary. Bricks of pig iron are used for any loads that may be applied to floors under investigation, and water is applied from a steam fire-engine, or from a manual pump, as required.

Records of temperature are taken as far as possible by pyrometers. The instruments used are recording pyrometers designed by the late Sir William Chandler Roberts-Austen, K. C. B., F. R. S., and manufactured by Messrs James Pitkin & Co. of London. They rely for their indications on the measurement of the current generated by the thermo-junctions, which are placed in various parts of the huts. These thermo-junctions are connected by insulated wires to the recording instruments, and the temperature at any point can be recorded or observed at any instant of time. The readings can be taken up to 3,000 degrees F., which is considerably higher than has so far been required at the testing station, where tests seldom require higher temperatures than 2,000 degrees F.

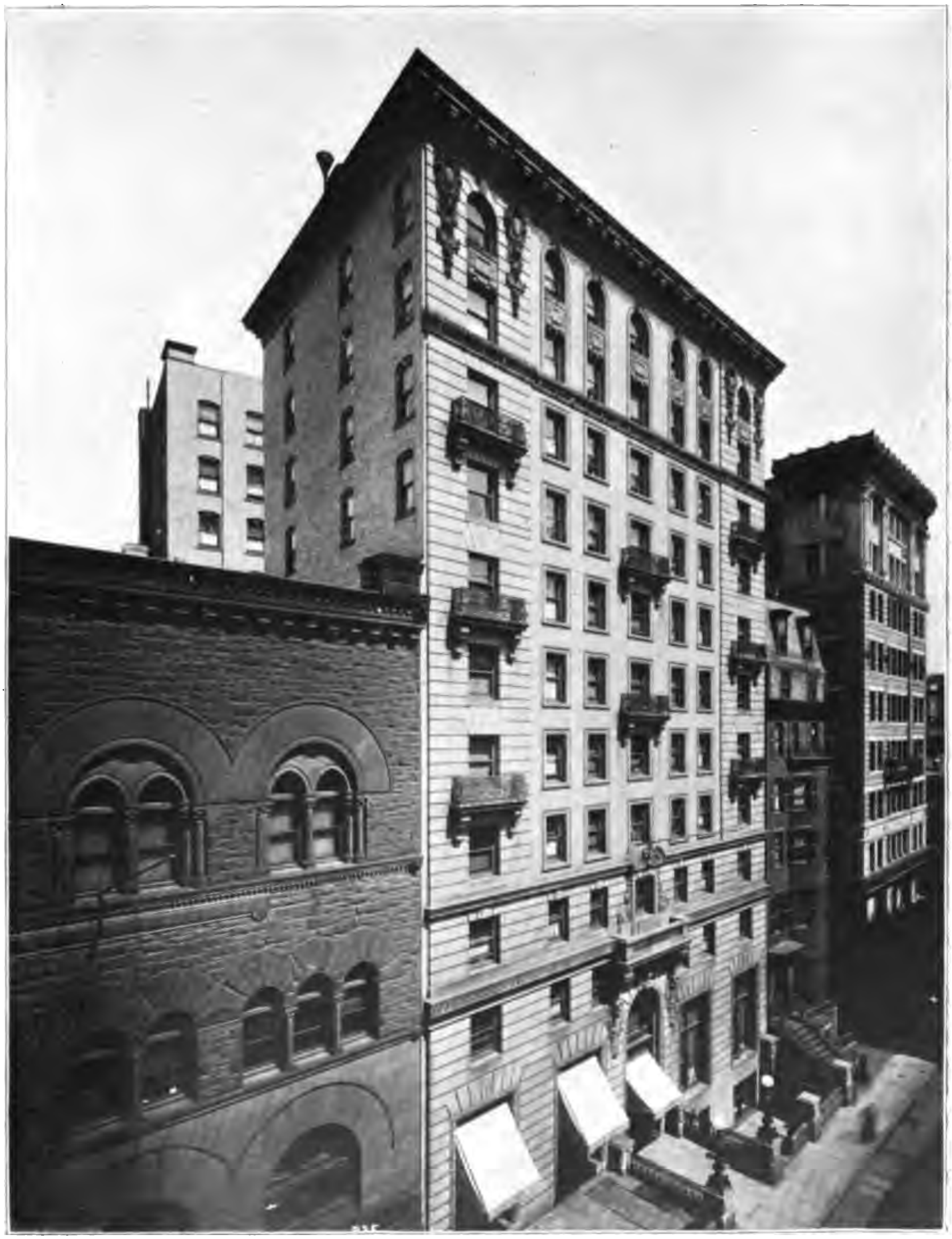
Visual observations as to work under investigation are also recorded as far as possible by photography.

Deflections are measured by lever and staff or by weights and pulleys.

There is a supplementary equipment available for any necessary laboratory tests with fire preventive, fire alarm and fire-extinguishing appliances, such as thermostats, sprinklers, etc. Similarly, arrangements have been made for conducting special tests with stoves, lamps, electrical apparatus, etc. The necessary electrical energy or hydraulic power for special tests is obtained from the Central Electric Supply Company's generating station.



A CURIOUS STREET SCENE IN BOSTON, AT STATE, CONGRESS AND DEVONSHIRE STREETS,
Showing at left the Worthington Building, Fehmer & Page, Architects; at right, the Brayer Building.
Cass Gilbert, Architect.



HOTEL BELLEVUE, BEACON STREET, BOSTON—PEABODY & STEARNS, ARCHITECTS.

THE RECONSTRUCTION OF THE CONTINENTAL TRUST BUILDING, BALTIMORE

(From *Engineering Record,* June 3.)

THE Continental Trust Company's building at the southeast corner of Baltimore and Calvert streets, Baltimore, Md., is a sixteen-story, modern, steel-cage office building about 100 feet square, with a 40x50 foot open light court in the middle of the south side. It was of steel-cage construction with closed rectangular columns supporting the walls at every story; the floorbeams and girders were flush top and bottom and were thoroughly protected by the 16-inch hollow-brick, flat-floor arches; the columns were fireproofed with hollow tile blocks. Five stories were faced with granite; the remainder of the street fronts were of brick with terra cotta trimmings; the rear walls were of common brick and the court walls were of common brick faced with gray pressed brick. The elevator screens and the stair frames were of cast and wrought iron and the stairs cast iron with treads of marble. Interior partitions were of 4-inch and 5-inch hollow tile up to a height of 7 feet above the floors in the corridors and above that were of wood glazed. All the office floors, doors, window sash and trim were of wood and the outer windows were not wire glazed or provided with steel shutters. D. H. Burnham & Co. were the architects and Charles McCall was the contractor. The building was completed in 1903 at a cost of about $1,100,000 and most of the rooms were occupied.

In the great fire of February 7 and 8, 1904, the building was exposed to intense heat on the Baltimore and Calvert streets sides, and the flames, driven by a fierce wind, entered through the upper story windows, carrying large quantities of live coals, and nearly all the woodwork, glass, marble, furniture and combustible contents of the building were destroyed, and much of the cast iron, plaster and thin tile partitions above the first story were badly damaged. The exterior granite and terra cotta were very badly injured, and most of the enameled brick facing was loosened, but comparatively little damage was done to the roof and floors, and practically none to the solid brick walls or the steel framework. The main structure was thus left substantially uninjured, as described in the *Engineering Record* of February 20, 1904, and thoroughly demonstrated the ability of a modern steel-cage building to resist great heat and serve as a barrier to external fires. This quality did not, however, safeguard the contents or finish of the building, and the condition of the latter, the character and extent of reconstruction needed and the method of making it are the subject of this article.

A general contract for all repairs, refitting and reconstruction was awarded to the Thompson-Starret Company of New York, and proved to be about equivalent to the construction of a new building after the steel framework and floors only are built, plus some repairs to the floors and exterior walls. Much of the rubbish had been removed and partitions had been taken down, and some necessary work done on other portions of the building before the contractors commenced operations, so that apparent discrepancies between the statements of existing conditions made in this article and those descriptive of the immediate effects of the fire can be reconciled by the explanation that the former are as observed by the contractor's superintendent, and the latter as hastily noted or estimated immediately after the fire.

The contractor took possession of the building July 11, and first completed the removal of the plaster and rubbish in the different stories. In the second story about one-third

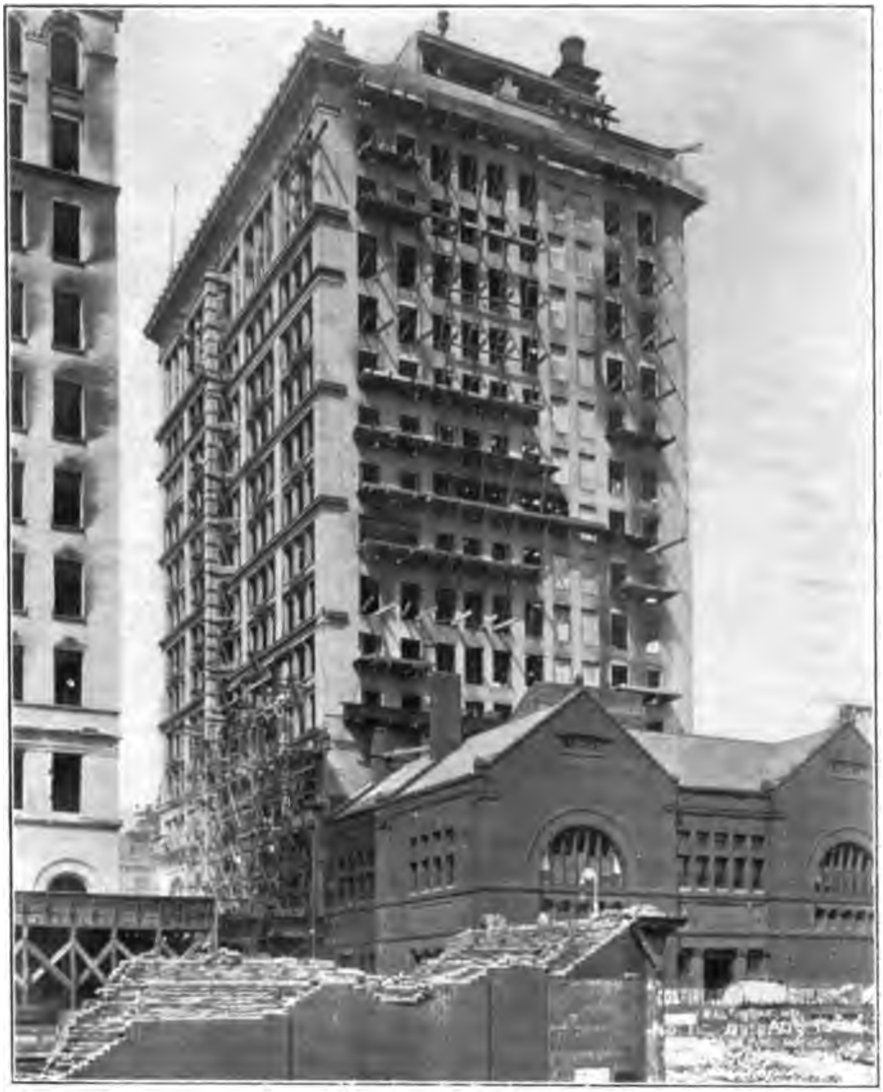


PLATE 1—OLD WALLS NOT YET REMOVED, AUGUST 15, 1904.

of the plaster was injured, and above the second story all of the plaster, trim, window, doors and wood floors were gone, and no partitions were standing except in the sixteenth story. About 95 per cent of the floor arches were standing, with the cinder concrete filling above them in apparently normal condition and the wooden screeds bedded in it to receive the floor boards entirely consumed. The plaster and tiling had sufficed to protect the steelwork from injury by the heat, even in most places where it had subsequently been detached. The mosaic floors in the toilet rooms were uninjured except by some cracking, and only required patching to restore them. All the halls had marble floors, which were calcined and destroyed, apparently by the fierce blast of hot air, as there was very little combustible material in the halls to cause flames. The ceilings were plastered directly on the arch tiles with hard, patent mortar, which was generally calcined and loosened, but still served as a shield against the flames. The cast-iron work of the stairways was not materially injured, and about 80 per cent of the marble treads were still servicable, although so much defaced that they were replaced.

On the exterior of the building the white-face brick were greatly damaged by the heat, and were useless, being friable and broken. The mortar appeared to have been cement and lime mixed, and it was apparently destroyed by the

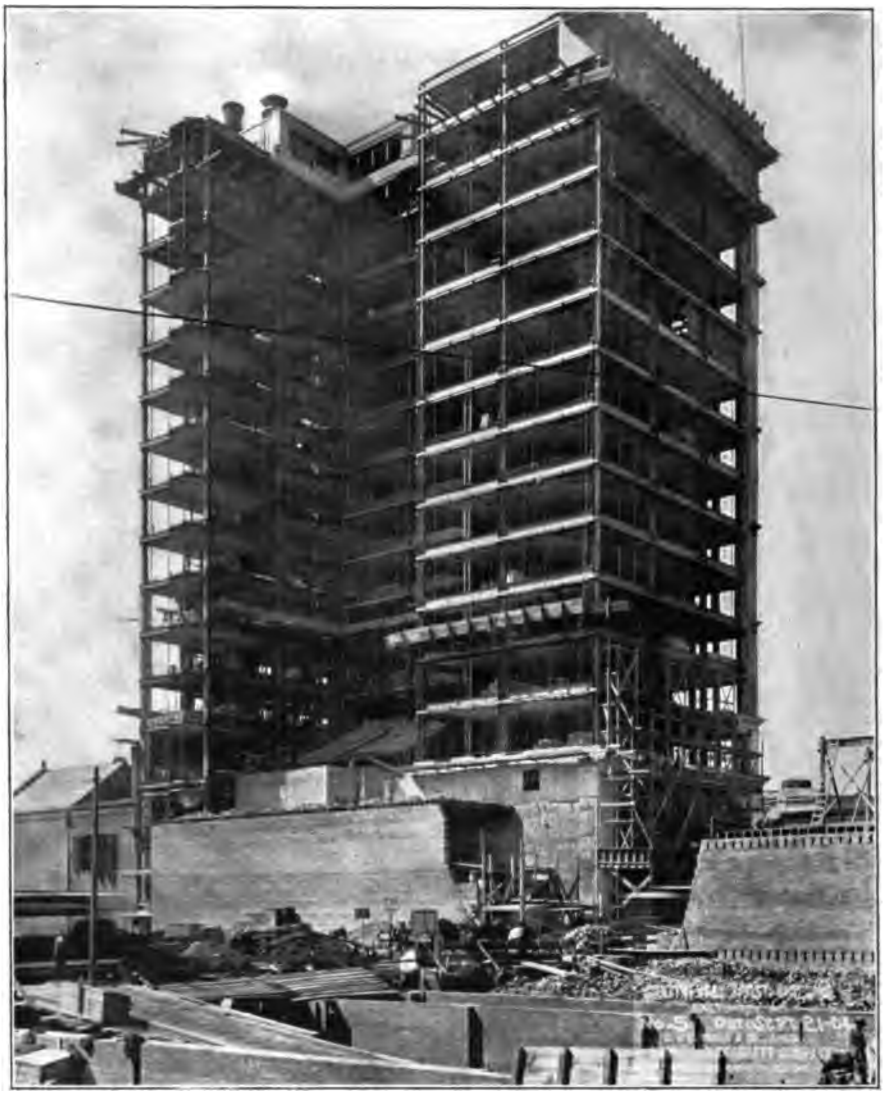


PLATE 2—OLD WALLS REMOVED AND SCAFFOLDS READY FOR NEW WALLS, SEPTEMBER 21, 1904.

heat. The face bricks were not bonded with the wall, but were attached to it with thin galvanized iron anchors, which pulled out of the backing and allowed the face brick to separate from the walls in large sheets, most of which, however, remained standing. On the Calvert street front, which was exposed to the fiercest heat, the only brick facing was in the piers between the windows of the upper eleven stories; the remainder of these stories was faced with terra cotta, which suffered the least of all the front walls and was in such good condition that in nine stories it was allowed to remain, requiring repairs in occasional places only.

On all outer walls, except Calvert street, everything was stripped from the steel framework from the cornice to the middle of the third story, thus removing 1½ stories of the granite facing. On Baltimore street about 30 per cent of the granite in the lower four stories also had to be removed, and on Calvert street ⅝ of all the granite was removed, and it was taken down to street level at the rear corner, but in all cases the brick backing was found in good condition.

All cast-iron mullions, spandrels and window frames were removed with the brickwork. Most of the mullions in the light court were badly sprung, often being bent in S shape and

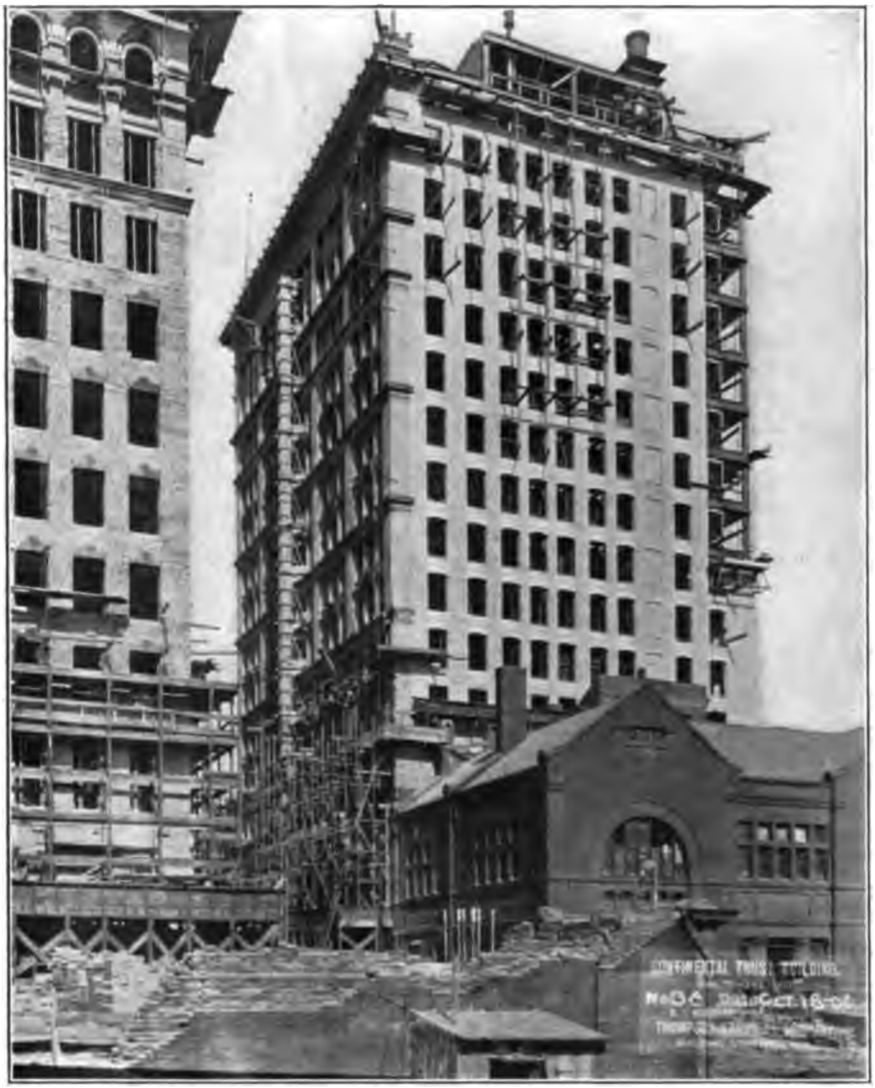


PLATE 3—VIEW OF NEW OUTER WALLS OF THE CONTINENTAL TRUST BUILDING, OCTOBER 18, 1904.

broken. They were originally fastened to 7-in. and 8-in. horizontal channels bracketed out from the wall girders. These channels were many of them badly bent and twisted, and in some cases were straightened and put back.

For removing the face granite, scaffolds were built up from the ground to the fifth story, as seen on the Calvert street front in the photographs of August 15 and October 18, and the sidewalk beneath them was protected by a heavy roof. On the rear side cantilever beams were projected from the windows and supported platforms at every story. From each of them inclined chutes were successively built of wood and canvas, covering the entire face of the wall and delivering inside the building to the next floor below. The framework for these chutes is seen in many places in the photograph dated August 15, and there appears like knee bracing for the cantilever beams. In the court and other walls all work was done from Foster scaffolds suspended by wire ropes from the top of the building to the fifth story, as shown by the photograph of September 21. Work was in progress removing the old walls from the upper tiers of scaffolds only at any given time. As many unskilled laborers as could find room on the scaffolds started at 3 a. m., by lantern light, and worked until 8 p. m., stripping the framework at a maximum rate of three stories in two days. The brickwork was pulled off by hand and chuted inside the building, where it was sorted and the good bricks cleaned and piled for use again. The debris and all rejected materials were delivered by an outside vertical chute from the different stories to three cars provided daily on a special siding of the Pennsylvania Railroad, which was laid close up to the building for this purpose.

The columns and wall girders were stripped and all exposed metal was thoroughly cleaned with wire brushes. It was found to be in excellent condition, and was painted one heavy coat of red lead and linseed oil. The walls were then rebuilt exactly as for a new building.

The new work was rebuilt according to the original plans, except that the cast-iron mullions were replaced by brick piers, and in the rear the window heads and sills were made with rowlock arches and stone sills to save time. Much trouble and delay was occasioned by the difficulty of replacing damaged terra cotta blocks, as it was generally necessary to take down a whole story of pier to remove a single piece and bond another properly in its place.

All floor arches were of the National Fireproofing Company's standard construction, of about 6-ft. span, made with hard tile, end construction flat arches filled up with 4 inches of cinder concrete in which were embedded 1-in. screeds covered by ⅞-in. tongue and groove floor boards or by the tile and marble surface already mentioned. The general condition of these floor arches was considered very good, and wherever repairs were necessary they were made and the floors restored to the original standard. In the third and fourth stories the bay-window rooms had wood-paneled walls and ceilings, and this excess of combustible material was apparently the cause of special injury to the arches in the floors above where the under sides of the tiles were entirely destroyed. The injured tiles, however, still possessed sufficient strength to support the floor, and these arches did not fall. In another place where the bottom surface of the arch tiles was gone, they still retained so much strength that the floor span sustained a concentrated test load of 600 pounds of sash weights without any perceptible deflection or cracks.

All the floors in the building were tested by passing over them, parallel with axes of the arches, an iron roller weighing 160 pounds per linear foot. The roller was as long as the arch span and was rolled between the beams so that the arch sustained its full weight. The axle projected several inches beyond the roller at each end, so that in case of the arch collapsing it would engage the floorbeam on each side and be prevented from falling through the floor into the story below, but in no case did the arch fail under the test. Large areas of the fourth floor appeared to be unbroken, and endured the roller test, but when examined seemed to be unsound, and were removed and replaced. All the floor arches which were used for storing materials or for walking on were temporarily covered with a layer of boards to protect the tiles from impact and help distribute the loads until they were repaired and concreted. Several thousand square feet of new arch tiles were purchased for renewals, and when it became impossible to get more delivered in time, concrete was used instead for floor slabs. The concrete was hand-mixed wherever needed and was made, for the main slab, 1:3:5 with 1-in. broken stone and Northampton Portland cement supplied by C. S. Goss & Co., New York. The same cement was also used for the cinder concrete filling and for the 1:3 mortar used for patching. Considerable difficulty was found in obtaining cinders for the concrete, and some were imported from other cities, because the great demand exceeded the decreased amount produced in Baltimore.

Where the floor arch tiles were uninjured, except by the loss of the bottom surface in lengths of 5 feet or less, the arches were considered safe, and were repaired simply by wire lathing and plastering the lower sides. Single defective tiles were generally not removed, but were filled in place solid with cement mortar. If more than one block in a span was damaged, the whole set from beam to beam was removed and replaced by new tiles or by a strip of concrete.

The roof construction was like that of the floors, but lighter, and was found in good condition, except that the tar and felt with which it was covered was buckled up and had to be all stripped off and replaced. Most of the steel and copper skylight frames were destroyed and new ones were put in their places. The floor repairs were made simultaneously with the rebuilding of the outer walls, and after they were completed the partitions were built, and carpentry, plastering, glazing, painting, metal and marble work and all other finishing were executed as in the original construction of a new building. Partitions were built to a height of 7 feet with National Fireproof hollow terra cotta blocks 3 inches and 4 inches thick, and were continued to the ceiling with woodwork and glazing.

Although the old floors had withstood the loads from the safes in the offices, provision was made in the reconstruction for special reinforcement under the safes weighing 7 tons or more. The concrete above the arches was made with stone instead of cinders in these places, and was reinforced by 2½x2½-in. T-bars, horizontal web down, spaced about 6 inches apart and reaching across three floorbeams.

None of the main steel framework of the building was found damaged or needed repairs except three of the floorbeams and the light wall channels in the court. In one place a panel of the floor arches was in position and appeared sound. They had protected the floorbeams from the flames, yet the latter proved to have sagged 4 inches, and had to be removed and straightened.

Reconstruction was fairly under way about the middle of July, and was practically finished about February 1, although the work was considerably delayed by strikes and hampered by the impossibility of getting building materials rapidly enough or in sufficient quantities. Especial difficulty was experienced in securing terra cotta, of which there never was enough on hand for a full day's work. Other material was therefore substituted for it as much as possible. Most of the labor was paid at the rate of $1.25 a day, and the pay-roll amounted to over $2,000 a week.

The reconstruction was executed in accordance with the architect's plans and specifications and was in charge of Mr. C. S. Neale, superintendent for the contractor, to whom acknowledgment is made for the data for this description.

EXTRACTS FROM THE NEW BUILDING ORDINANCE OF THE CITY OF CHICAGO

ADOPTED MARCH 13, 1905

(Continued from July.)

SPECIFICATION FOR REINFORCED CONCRETE.

947. (Reinforced Concrete—Regulations in Regard to the Use of).—The term "reinforced concrete," as used in this ordinance shall be understood to mean an approved concrete mixture reinfroced by steel of any shape, so combined that the steel will take up the tensional stresses and assist in the resistance to shear.

948. (Stress.)—Reinforced concrete construction shall be of such nature that the stresses can be calculated according to the accepted formulas of modern concrete engineering practice.

949. (Permission to Erect.)—Before permission to erect any reinforced concrete structure is issued, complete drawings and specifications shall be filed with the Commissioner of Buildings, showing all details of the construction, the size and position of all reinforcing rods, stirrups, etc., and giving the composition of the concrete.

950. (Concrete—Mixing of—Method of Testing.)—The concrete shall be mixed in the proportions of one of cement, three of sand, and five of stone, gravel or slag. The proportions shall be such that the resistance of the concrete to crushing shall not be less than two thousand pounds per square inch after hardening for twenty-eight days. The tests to determine this value shall be made by a competent engineer under the direction of the Commissioner of Buildings. The concrete used in reinforced concrete construction shall be what is usually known as a wet mixture.

951. (Cements—Method of Testing.)—Only high-grade Portland cements shall be used in reinforced concrete construction. Such cements, when tested neat, shall after one day in air develop a tensile strength of at least two hundred pounds per square inch; and after one day in air and six days in water shall develop a tensile strength of at least five hundred pounds per square inch; and after one day in air and twenty-seven days in water shall de-

velop a tensile strength of at least six hundred pounds per square inch. Other tests as to fineness, constancy of volume, etc., made in accordance with the standard method prescribed by the American Society of Civil Engineers' Committee, may, from time to time, be prescribed by the Commissioner of Buildings.

952. (Sand—Torpedo.)—The sand to be used in such concrete shall be clean, sharp torpedo sand, free from loam or dirt.

953. (Stone—Crushed, Slag or Gravel.)—The stone used in such concrete shall be clean, crushed stone or gravel, or crushed blast furnace slag of a size that will pass through a three-quarter-inch ring. The stone shall be fresh broken, and the gravel shall be thoroughly washed.

954. (Steel.)—The steel used shall be calculated according to its elastic limit; for moving or vibrating loads a steel of a lower elastic limit than is used for quiescent loads shall be used.

955. (Reinforcing — Method of.) — All reinforcing steel shall be completely enclosed by the concrete, and such steel shall nowhere be nearer to the surface of the concrete than the diameter of such reinforcing steel bar, or rod or other shape. The steel in beams or girders shall be so disposed that there shall be not less than one and one-half times the thickness of the steel in concrete between the steel, and, where more than two bars are used the bars shall be placed in two or more planes.

Reinforced concrete shall be designed that the stresses in the concrete and the steel shall not exceed the following limits: Extreme fiber stress on concrete in compression, five hundred pounds per square inch; shearing stress in concrete, seventy-five pounds per square inch; concrete in direct compression, three hundred and fifty pounds per square inch; tensile stress in steel, one-third of the elastic limit; shearing stress in steel, ten thousand pounds per square inch.

The adhesion of concrete to steel shall be assumed to be seventy-five pounds per square inch of surface where bars are three-quarters of an inch or less in diameter, and proportionately less for bars of a diameter greater than three-quarters of an inch.

The ratio of the moduli of elasticity of concrete and steel shall be taken as one to twelve.

The following assumption shall guide in the determination of the bending moments due to external forces: Beams and girders shall be considered as simply supported at the ends, no allowance being made for continuous construction over supports. Floor plates, when constructed continuous and when provided with reinforcement at top of plate over supports, may be treated as continuous beams, the bending moment for uniformly distributed loads being taken at not less than W. L. divided by eight; the bending moment may be taken at W. L. divided by twenty in the case of square floor plates which are reinforced in both directions and supported on all sides. The floor plate to the extent of not more than five times the width of any beam or girder may be taken as part of that beam or girder in computing its moment of resistance.

The moment of resistance of any reinforced concrete construction under transverse loads shall be determined by formulas based on the following assumptions:

(a) The bond between the concrete and steel is sufficient to make the two materials act together as homogeneous solid.

(b) The strain in any fiber is directly proportionate to the distance of that fibre from the neutral axis.

(c) The modulus of elasticity of the concrete remains constant within the limits of the working tresses fixed in this ordinance.

From these assumptions it follows that the stress in any fiber is directly proportionate to the distance of that fiber from the neutral axis.

The tensile strength of the concrete shall not be considered.

956. (Construction—Reinforced Concrete.)—Reinforced concrete construction shall be designed so that the shearing stresses, both vertical and horizontal, developed in any part of the construction, shall not exceed the safe working strength of the concrete as fixed in this ordinance, or a sufficient amount of steel shall be introduced in such a position that the deficiency in the resistance to shear is overcome.

When the safe limit of adhesion between the concrete and steel is exceeded, some provision shall be made for transmitting the strength of the steel to the concrete.

957. (Columns—Reinforced Concrete.)—Reinforced concrete may be used for columns when the ratio of length to least side or diameter does not exceed twelve. The reinforcing rods shall be tied together at intervals of not more than the least side or diameter of the column, or spirally wound steel may be used.

When vertical reinforcing rods are used in columns, such rods shall have their ends milled normal to the longitudinal axis, and such rods shall have full perfect bearings at each joint, and such joint shall occur only at floors or other points lateral support and a tight-fitting sleeve shall be provided at all joints of vertical reinforcing rods.

958. (Wind Pressure.)—In the case of buildings in which allowances must be made for wind pressure as provided in Section 1013 of this ordinance, the reinforcing rods of columns shall be connected and the milled end surfaces shall be brought together by threading the rods and by threaded sleeve nuts, or threaded turnbuckles, or methods equally effective and satisfactory to the Commissioner of Buildings.

959. (Tests—To be Made by Contractor on Demand.)—The contractor shall be prepared to make load tests on any portion of a reinforced concrete construction within a reasonable time after erection, as often as may be required by the Commissioner of Buildings. Such tests shall show that the construction will sustain a load of twice that for which it is designed, without any sign of failure, or in the case of beams, girders or floors, without deflecting more than one-seven-hundredths of the span.

960. (Reinforced Concrete Walls.)—Buildings of Classes I., II., III., VI. and VII. having a complete skeleton construction of steel or of reinforced concrete construction or a combination of both, designed to safely resist all of the strains caused by the dead weights of the structure and of the live loads and of the wind pressure within the safe limits of stress provided in this ordinance for each material used, may have walls of reinforced concrete six inches thick for the upper two stories and walls seven inches thick for the two stories next below the upper two stories and walls eight inches thick for the stories next below the upper four stories and walls nine inches thick for the stories next below the upper six stories, and so on downwards, increasing the thickness of the walls one inch for each two stories, or part thereof. Provided, however, that such walls shall support only their own weight and that such walls have steel rods three-quarters of an inch in diameter, or of an equivalent area set vertically and spaced not more than eighteen inches apart, and steel rods five-eights of an inch in diameter or of an equivalent area set horizontally tied to the vertical rod at each intersection with these and set not to exceed twenty-four inches apart, and provided that where the weight of the walls of each story is not transferred to the skeleton by spandril beams the vertical reinforcement shall be increased in weight in an arithmetical ratio of twice as much steel in the two stories next below the upper two stories and three times as much steel in the two stories next below the upper four stories, and so on downward. Vertical bars shall be spiced together by winding with iron wire. Horizontal bars shall be wired to the columns. Additional bars be set around openings the verticals wired to the nearest horizontal bars and the horizontal bars at top and bottom of openings shall be wired to the nearest vertical bars.

The steel rods shall be combined with the concrete and placed where the combination will develop the greatest strength, and the rods shall be staggered or placed and secured to the steel or reinforced concrete structural skeleton of the building, so as to resist a pressure of fifty (50) pounds per square foot, either from the exterior or from the interior on each and every square foot of each wall panel.

APPROVED CINDER CONCRETE CONSTRUCTION.

968. (Concrete Construction—Approved Cinder.)—The term "approved cinder concrete construction" shall apply to all buildings in which all parts that carry weights or resist strains, all exterior walls, all interior walls, all interior partitions, all stairs and all elevator enclosures are made entirely of incombustible material, and in which all metallic structural members are protected against the effects of fire by approved cinder concrete proportioned, mixed, applied and secured as herein described. Approved cinder concrete construction may be used for all buildings in which fireproof construction is mandatory by this ordinance, or where ordinary construction may be used.

969. (Concrete — Cinder — Approved).—Approved cinder concrete shall consist of a standard Portland cement, torpedo sand, and clean, thoroughly burnt, steam boiler cinders, free from deleterious matter, no particle of which shall be larger than one inch.

970. (Cinders — Quality).—The volumetric quantity of the cinders combined with the torpedo sand shall not exceed the volume of the Portland cement by eight (8) times. All of the ingredients of approved cinder concrete shall be thoroughly worked and wet so as to cover each piece of cinder with moistened cement; and, the cement and sand shall fill all of the voids between the cinders.

All approved cinder concrete shall be cast and rammed in an unset condition against the metal.

The minimum thickness of approved cinder concrete covering in structural metal shall be two (2) inches. In every case the thickness of the coverings shall be measured from the extreme projection of the structural metal unless otherwise provided in this ordinance.

971. (Columns Approved—Concrete Coverings.)—The approved cinder concrete covering of the columns shall be not less than three (3) inches in thickness from the extreme projection of the metal, including the plastering, and in all cases the cinder concrete shall be rammed solid against the column metal, filling all channels and open spaces within the perimeter of the finished plaster column. Approved cinder concrete column covering shall have metal binders of No. 8 gauge wire imbedded in and around the columns for each sixteen (16) inches in height of the column, provided, however, that in buildings of approved cinder concrete construction the columns may be covered with one thickness of metal, furring metal, lathing, and not less than three coats of mortar.

In places where there is trucking or wheeling, or handling of packages of any kind, the lower five (5) feet of each and every column shall be incased in a protective covering such as is described in Section 923 of this ordinance.

972. (Beams and Girders—Approved Concrete Construction.)—The beams and girders of a building built of approved cinder concrete construction shall be enclosed in approved cinder concrete, which shall be not less than two (2) inches in thickness at any and all points of the structural metal work. The approved cinder concrete covering shall be reinforced with metal clips or wire binders, either or both of which shall not be more than sixteen (16) inches on centers in the direction of the length of the structural member.

The top of all girders or beams shall be protected with not less than two (2) inches of approved cinder concrete.

A roof or floor construction of cinder concrete may be used for any span betewen structural members that will carry the test loads required by city ordinance for such floors and roofs.

973. (Segmental Arches).—Segmental arches shall be not less than three (3) inches in thickness at the crown.

974. (Floors—Flat Slab Construction.)—Flat slab construction shall be not less than four (4) inches in thickness for spans of eight (8) feet or less. Flat slab construction shall be not not less than five (5) inches in thickness for spans between eight (8) and ten (10) feet.

Approved cinder concrete shall not be used as a floor or roof construction unless such approved cinder concrete is reinforced by steel or iron, and such reinforcement shall not weigh less than three-quarters of a pound per square foot of superficial surface.

All reinforcing steel shall be completely enclosed by the concrete.

Wood nailing strips for floor surfacing may be used in buildings of approved concrete construction, provided, however, that such nailing strips shall be imbedded as described in Section 934 of this ordinance.

975. (Partitions.)—The partitions in buildings of approved cinder concrete construction shall be as described in Section 935 of this ordinance for partitions in fireproof buildings, provided, however, that partitions may be built wholly of metal studding, metal lath and plaster, but no such partitions shall be of a lesser thickness than one and one-half (1½) inch.

The partitions around stairs, or stair-halls, or shafts, or elevators, or public lavatories, shall be wedged tight between the structure of the floors and ceilings, or if such partitions are of plaster, the metal or metal studding shall be secured to the structure by clips, bolts or other metal fastening, and in no case shall any such partition be built on the wood flooring or wood nailing strips.

976. (Walls — Enclosing). — The enclosing walls, the covering of exterior side of mullions, beams, girders, lintels, the enclosure of pipes, pipe shafts, the doors into shafts, windows into shafts, covering of girders, covering of trusses, cut-out boxes, chases, stairs, landings, painting, rivets, bolts, inspection of truss designs, inspection of trusses, precaution against wind pressure, and all other items required in the sections on fireproof construction and in the sections on skeleton construction shall, in buildings of approved cinder concrete construction, be designed or built or covered, or made of the material called for or any one or a number of these requirements, as described in such sections describing the requirements of skeleton construction or of fireproof construction in this ordinance, provided, however, that approved cinder concrete as described herein may be used for all protective covering of structural metal.

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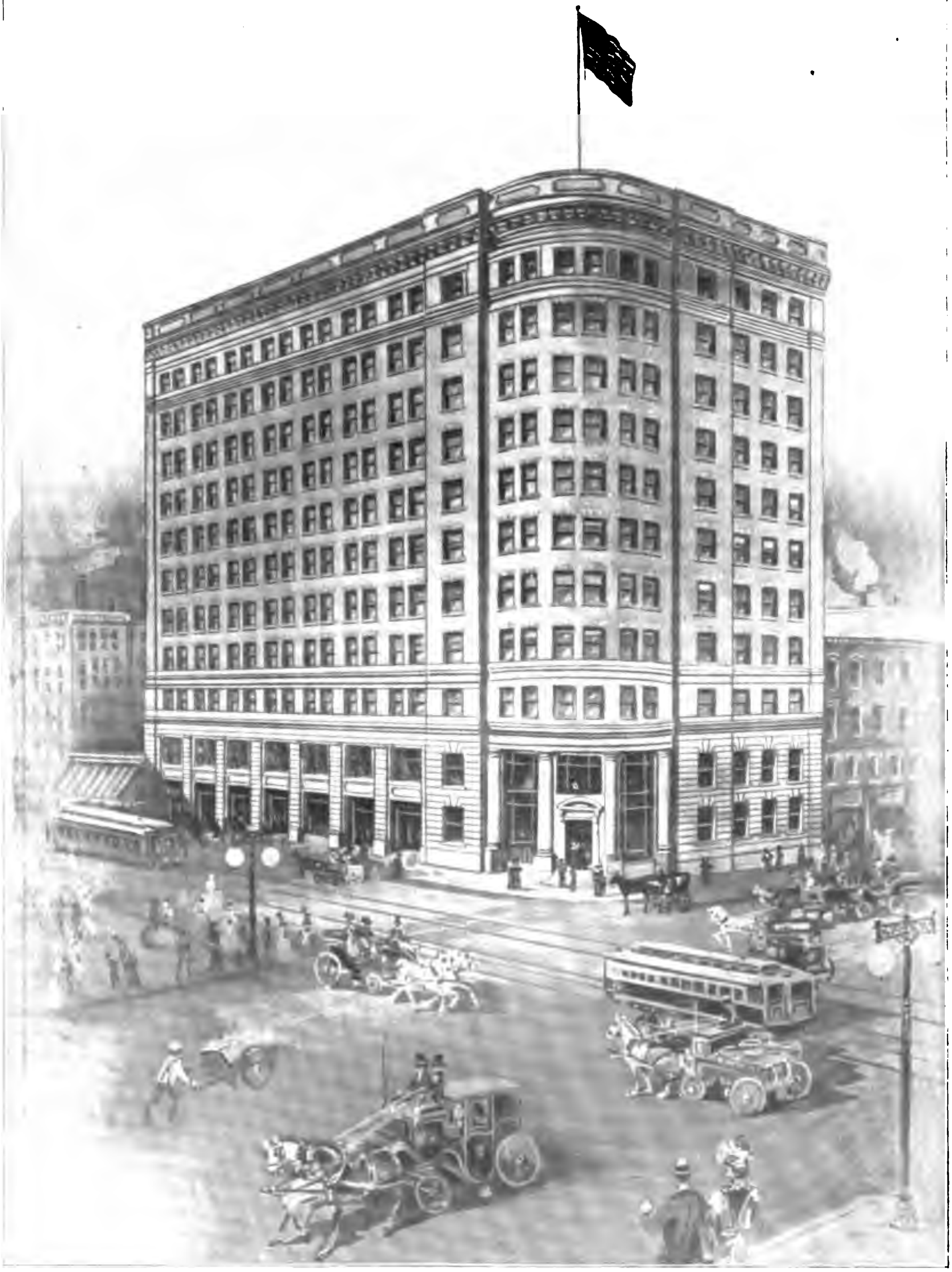

FIRST NATIONAL BANK BUILDING, UNIONTOWN, PA. D. H. BURNHAM & CO., ARCHITECTS.
From the architects' perspective drawing. See article "A New Field," page 21.

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THE NATIONAL FIREPROOFING COMPANY'S TEST OF HOLLOW TILE CONSTRUCTION AT LONDON

IN the letter of one of our London correspondents, Mr. Ellis Marsland, general honorary secretary of the British Fire Prevention Committee, which appeared in FIREPROOF MAGAZINE for August, in the course of his description of the purposes of the committee and the opening of its new testing station, he made only the following brief mention of one of the tests made on that occasion: "On the opening day at the new testing station the floor under review was by a Pittsburg firm." At that time we had no other information regarding this test than a brief cablegram announcing its complete success. We had hoped to receive a full account of the test, with illustrations, for the present issue. But the report has not yet been received. We have, however, a short account by mail, from which the following facts are derived:

The fire-resisting floor arch construction which was tested consisted of hollow tiles of burned clay material, with a reinforcement of metal in the form of a wire truss. This arch was supported by steel I-beams, spaced at proper distances to safely sustain the superimposed load to be carried.

The requirements of the British Fire Prevention Committee are very rigid indeed and consist of fire test of four hours at a temperature of 1,700 degrees, after which water is applied to the under side of the arch.

The test was made on the 28th of June and was successful in every way. The test was not started until 3:45 p. m., as there were two other tests earlier in the afternoon. The account goes on to say:

"The temperature was brought to 1,000 degrees F. within ten minutes and then hung between that and 1,300 degrees for some considerable time, and did not reach 1,850 degrees F., which was the highest point they reached, except during the last hour, although several individual points showed that temperature for considerably longer time, but the average of nine points is the degree quoted.

"Exactly on the expiration of the four hours the gas was shut off and the water played on through a seven-eighths-inch nozzle. Before the water was played on, however, we had a good look at the ceiling and found, to our astonishment, that not one bit of the plaster had fallen. This occasioned very great surprise, and Mr. Sabey, who was present and who supplied the material from which Mr. Bevier made the plaster, took considerable 'kudos' for himself on this head.

"The water was played on for exactly five minutes and being pumped so that they could define the pressure, which was at part of the time 125 pounds; but they reduced it to 80 pounds.

"After the water had stopped we found that there was not a crack in the terra cotta, but, of course, more than half of the plaster had fallen away. The deflection of the protected beams did not at any time exceed three-eighths of an inch."*

FIREPROOF HOTELS ON THE ATLANTIC SEABOARD

THE editor of the Atlantic City (N. J.) *Gazette* is so much elated over the fireproof qualities of the new Chalfonte Hotel in that seaside resort that he has convinced himself that Atlantic City really has a corner in fireproof hotels, and for that reason ought to make all its hotels fireproof. He says: "It is the only resort in the country which can invest money enough to have fireproof hotels and get enough out of them to pay the investor." This, he thinks, gives Atlantic City a distinctive advantage over all competitors. "It is one of the monopolies that makes investments in property here secure." He says that a fireproof hotel of the Chalfonte type "is not possible in Cape May nor Asbury Park nor Ocean City." And all because Atlantic City has a longer season for business. This is all very encouraging for the art of fireproofing in Atlantic City, and we hope all the other hotels will be rebuilt after his advice in a thoroughly fireproof manner. If they do we know that they can offer the traveling public another attraction. But we doubt if they will get the anticipated monopoly of the "resort" business. The example would quickly be followed by other resorts, for they would have to stand between two dilemmas—vacant rooms and financial ruin on the one hand and fireproofing on the other. There is no doubt but that they also would prefer fireproofing as an investment, for to them it would be their only salvation.

But our enthusiastic editor, while he may perhaps be clinching his argument with a new reason why Atlantic City can have a hotel monopoly, may, we fear, unintentionally throw cold water on further investments in fireproof hotels, for he adds: "The cost of rooms is so great in a fireproof house that the strictly summer hotels could not get their money out unless exorbitant prices were charged, and the public would not stand for more than the ordinary rates." Here we cannot agree with him any longer, and think it would have been well, both for the force of his own argument and the future of the art of hotel fireproofing, had he been silent. The cost is not so very great, as he supposes. A very slight rise in room rates would be enough to compensate a hotel man for constructing his building according to the best fireproofing systems, wherever it might be located, and the public would appreciate it for its worth and make the hotels in other cities good paying investments if their owners should try the experiment. But we congratulate Atlantic City all the same, and wish we were there, especially at this season, to enjoy its ocean breezes.

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*Since the above was in print we have received a copy of the official report, which is reprinted elsewhere in this issue. We therefore ask the indulgence of our readers for the short delay necessary for its appearance.

A CONCRETE FLOOR COLLAPSE DUE TO IGNORANCE AND INCOMPETENCE

THE latest recorded concrete floor collapse occurred at Louisville on the 27th of July. It was in the second story of the Interurban terminal of the Louisville Railway Company on Jefferson and Green streets, between Third and Fourth avenues. Four men were precipitated to the ground floor 20 feet below. Two were seriously injured and the other two slightly bruised. The area which fell was about 10 by 15 feet. According to the newspaper accounts, the collapse was due to the faulty way in which the centering was secured. It was hung from the I-beams by ¾-inch bolts, which were "hooked" over them at the top ends and furnished with threads and nuts at the lower ends for tightening the centering. After the accident several of these bolts were found with their upper ends nearly straightened. The concrete was being spread on the centering when it fell. The same accident might have happened with any other system of construction, but the incident shows that such work is still being done by incompetent men who have no knowledge even of the strength of the tools with which they work. They did not seem to know that the hooked end of a soft iron bar will not carry more than a fraction of the strain which the bar itself will sustain longitudinally.

REFERRING to our editorial in FIREPROOF MAGAZINE for August, Mr. Stockton B. Colt, architect for the model fireproof Barclay office building in New York, writes us that the wired glass skylights in that building have side lights in the form of louvres, which can be opened mechanically, and Monitor ventilators at the top, which are always open. He says that the insurance charge for skylights in New York is eliminated when wired glass skylights in metallic frames are used, but a charge would be made if the skylights were partly of breakable glass. He has evidently done the best thing to procure safety from the exterior hazard and to save insurance as well. But the exterior hazard from skylights made partly of breakable glass is of little moment in such a building as he has erected, with combustible interior finish eliminated.

One of the greatest dangers where nonbreakable skylights are used is to the occupants of a building, who might be suffocated by smoke from a very small interior fire. Breakable skylights are practically automatic fire vents and are especially needed over elevator shafts. They are required by the Chicago building ordinance, but must be protected by wire mesh, which is used to prevent burning embers from fallnig into the building.

A SEATTLE paper reports that John A. Roebling Sons Company have commenced the construction of a four-story building on First avenue south, and that "the building will be of heavy mill construction throughout, capable of sustaining a load of 750 pounds per square foot on every floor." It is 77 by 150 feet in size. In the same article is a flattering announcement of fireproof work of the Roebling Construction Company, which inferentially will have its agency in the building. But what we cannot find out is why the Roebling company does not use its own system in this building instead of "heavy mill construction" to carry the loads above quoted. There is a hackneyed expression about doctors not taking their own medicine, but it has not heretofore been applied to fireproofers.

THE city council of Baltimore seems to be still wrestling with the difficult problem, "How to make the Eastern Female High School fireproof." It seems that in the latter part of June the Board of Estimate held a special meeting to consider the ordinance that had been introduced appropriating $38,000 for that purpose. City Solicitor Bruce having decided that it would not be legal for the city to merely authorize the contractors to proceed with the work for the additional amount, gave it as his opinion that the additional work could not be contracted for without formally advertising for bids. This was not provided for in the ordinance and consequently it was reported back unfavorably. The Baltimore papers state that a new ordinance will be drawn up in the fall, and Mr. Bruce is to advise as to the proper form of the specifications and advertisement.

IN the private letter from which we quoted above for an account of the test made in London on June 28, reference is made to the fact that the plastering on the under side of the floor was not affected by the heat of 1,850 degrees F. up to the time that the stream of water was applied. The cold water, however, destroyed the plaster, but did not crack the tiles. The official report, received later, calls it "Seraphite" plaster and says it was put on in three coats, one inch thick altogether. This is very interesting and we will look for further information about the material of this plastering. Heretofore at various times FIREPROOF MAGAZINE has given the opinion that plain lime and sand plastering, without any other ingredients, is the only approach to a fireproof plaster. But in all the tests we have ever heard of the plastering, of whatever kind, has been practically destroyed by the heat alone. Here, then, is something that may prove to be very valuable in fireproof work, for if the plastering can only hold during the fire it will always be a valuable auxiliary for any kind of fireproof material, concrete included.

As far as the tiles in this test are concerned, the charge that has been made that the bottoms of hollow tiles will flake off by reason of their greater expansion on the exposed side does not hold good in this case. They were "semi-porous" tiles, which we have always contended are the best, and ought to be specified by all architects.

THE MAJESTIC THEATER BUILDING AT CHICAGO

THE Majestic Theater and Office building is one of Chicago's newest structures which might attract considerable interest owing to its difficult construction, as well as being the first playhouse erected under the revised building ordinances.

The latter condition, without a doubt, gives the public one of the safest places of amusement ever erected. The architect, Edmund R. Krause, has not only endeavored to follow the building laws without a variance, but in the majority of cases has met the requirements twofold.

In a previous issue of this magazine a complete description of the "office building" was given, hence a little general information only need be enumerated here in order to form a correct idea of the arrangement.

The building is located on Monroe street between State and Dearborn streets, having a frontage of 81 feet 6 inches and a total depth of 192 feet. It is bounded on either side and the rear by an alley 15 feet wide. The office building proper extends back to a depth of 62 feet and is 20 stories in height, in addition to a deep basement. The theater occupies a goodly portion of the floor area in the first five stories, as well as the remaining 130 feet of the lot.

In consulting the plan (Plate No. 1), the main entrance to the theater is through a large open "outer lobby," which has a clear height of 30 feet. This opens into the main promenade foyer, on one side of which is a wide stairway leading to the balcony, and on the opposite side the ticket office. Entering a little further, a wide stairway on either side leads down to the retiring rooms, and we now pass into a wide cross corridor, which, in turn, gives five separate entrances into the main "orchestra" floor. The stair in this corridor leads to the mezzanine boxes, and at the extreme ends "Exit" doors, 6 feet in width, open directly into the alleys. The gallery entrance is from the east alley.

In order to form a general idea of the seating capacity and the means provided for escape in case of an emergency, the following data have been tabulated:

	Number of Seats.	Number of Emergency Exits	Total Width of Exits in Inches	Exit Capacity per 100 people
Orchestra floor......	732	13	740	101
Mezzanine boxes	332	6	336	101
Balcony	504	11	560	111
Tunnel gallery	264	7	318	117
Gallery	218	5	252	116
Totals	2,050	42	2,206	

From these results it is readily seen that, although the law requires 20 inches of exit width per 100 people, this playhouse has arranged for 109 inches per 100 people, or five times in excess of the ordinance.

The entire auditorium floor is formed by concrete arches springing from the steel floor beams. Wood carriages and floor strips are bedded into the concrete, thus forming the concrete arcs and receiving the finish maple floor.

The balconies and galleries are entirely of steel—the cantilever type of construction being used. (See Plates 2 and 4.)

As seen in the photograph (Plate No. 5), the four balcony cantilever girders are supported by columns whose foundations are at the basement floor level. The purlines framing in between these girders are I-beams and channels, and they, in turn, receive the skeleton stepping, which is

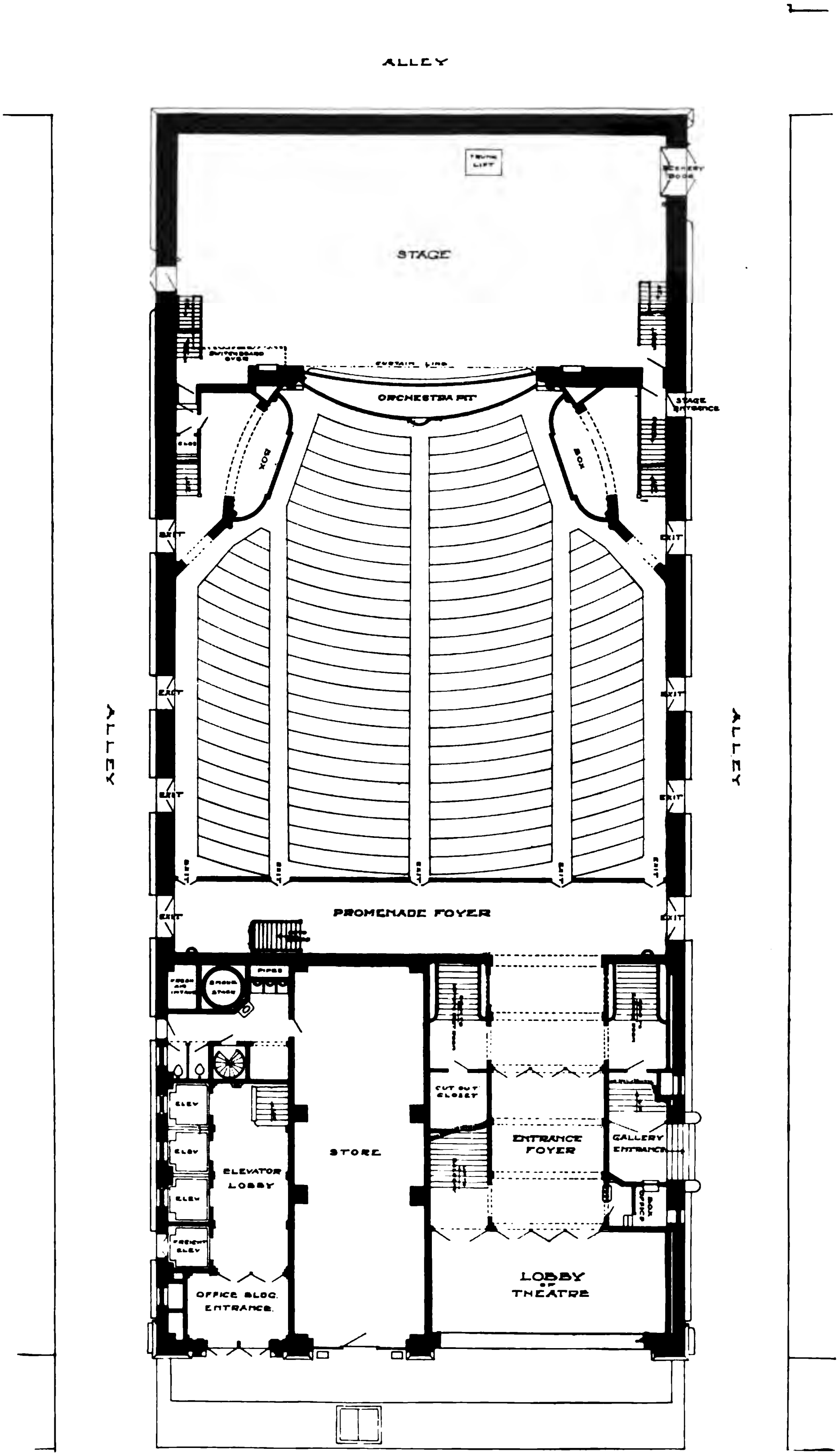


PLATE NO. 1—MAIN FLOOR PLAN. MAJESTIC THEATER AND OFFICE BUILDING.
Edmund R. Krause, Architect.

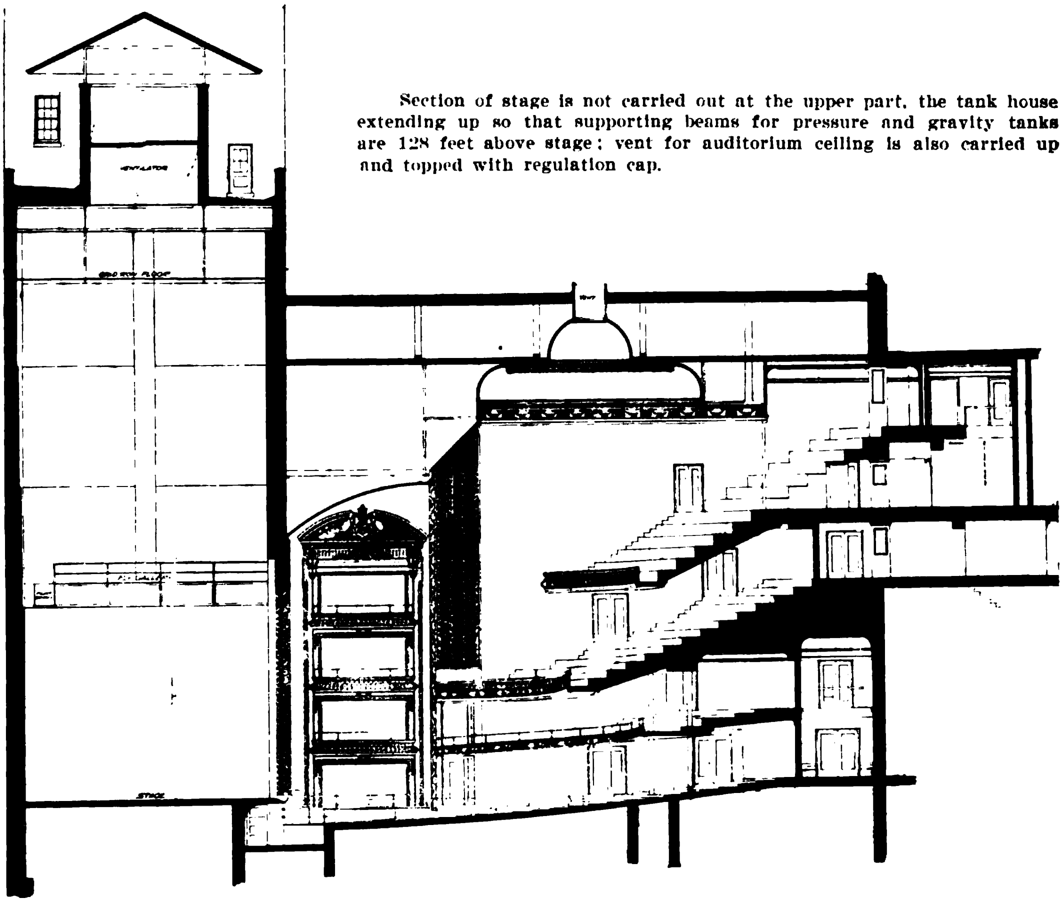
formed by angles strutted up from the channels. (See Plates 3, 4, 5 and 6.) The finish facias are heavy boiler plates securely bolted to the bent angles. The floors are constructed by placing heavy galvanized corrugated sheets in between the continuous curved angles. These sheets are then bedded with a rich Portland cement concrete of limestone screenings 3 inches in thickness. Wood sleepers, 12 inches on centers, are laid in flush with the surface of the concrete and the finish floor then secured.

The mezzanine boxes are constructed by cantilevers framed from these same columns supporting the balcony and the general floor construction is typical.

The marked difference in the gallery construction is that the cantilever girders are suspended from a roof truss by heavy steel tension rods, and by this means affords a clear, unobstructed line of sight in the balcony below. (See Plate No. 2.)

Additional means of exit are afforded in this gallery by the three tunnels built at a level of one-half the full height of the stepping. These tunnels lead into an independent corridor, which has direct outer exits as well as a wide stairway to the alley below.

The "Exit" doors throughout are made of heavy steel plate formed according to special detail. The upper panels are wire glass and the frames are built up of chan-



Section of stage is not carried out at the upper part, the tank house extending up so that supporting beams for pressure and gravity tanks are 128 feet above stage; vent for auditorium ceiling is also carried up and topped with regulation cap.

PLATE NO. 2—LONGITUDINAL SECTION. MAJESTIC THEATER AND OFFICE BUILDING.
Edmund R. Krause, Architect.
Room shown under auditorium near orchestra pit is the plenum chamber. Room at rear under auditorium floor is air purifying room.

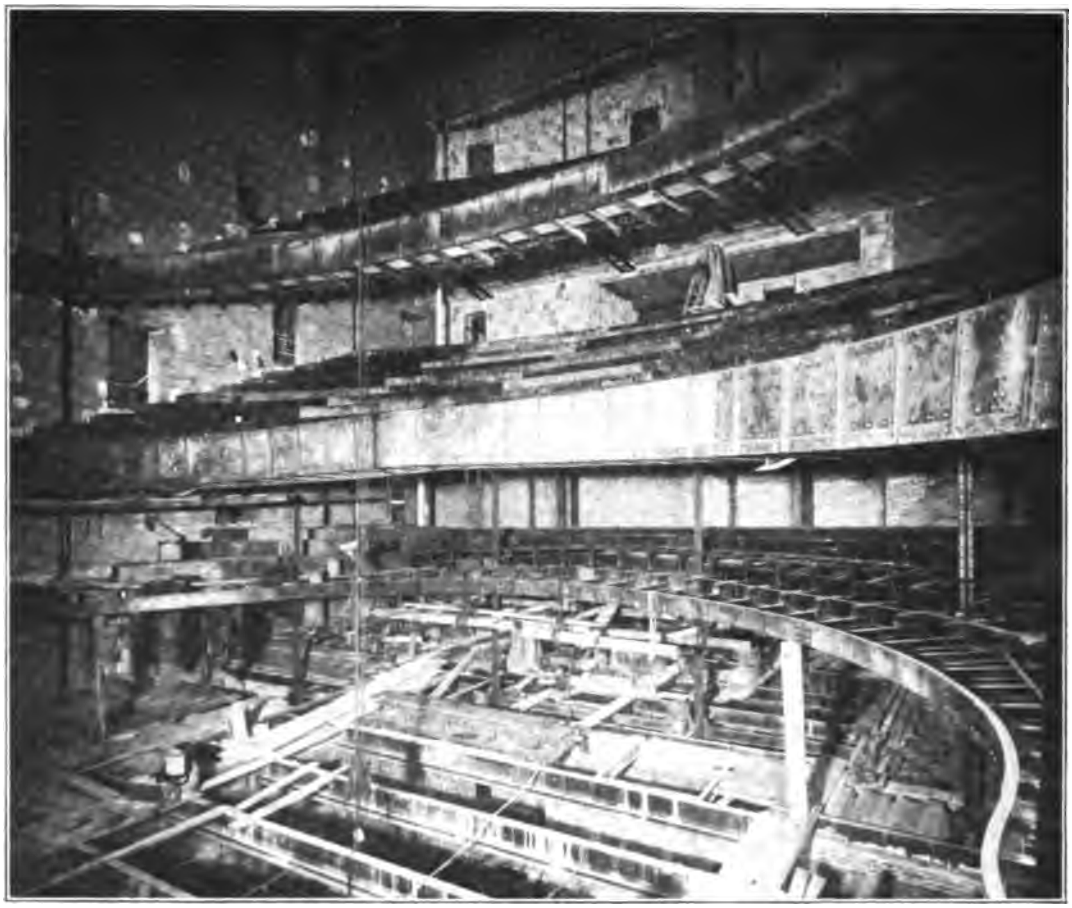


PLATE NO. 3—LOOKING FROM PROSCENIUM BOX TOWARD GALLERIES, SHOWING FRAMING OF GALLERIES. MAJESTIC THEATER AND OFFICE BUILDING.
Edmund R. Krause, Architect.

nels, which receive a molded steel casing and iron door stops.

The attic over the auditorium has both floor and roof construction of the typical tile arch, and the principal members of the trusses are fireproofed with tile and concrete. The large truss from which the gallery is suspended extends some feet below the auditorium ceiling and is most carefully fireproofed with tile and a concrete filling. (See Plate No. 2.)

Having discussed at some length the general construction, it might be well to add a few words in regard to the interior finish, heating and ventilating, etc., as these factors must be weighed in order to view the whole from a fireproof standpoint.

The auditorium is finished in bold and well-modeled plastic relief, care being exercised to keep in a scale proportionate to the varied heights. The side walls are simple in treatment, but the proscenium arch and boxes are made predominating features. The outer lobby, which was mentioned heretofore, is wainscoted to a height of 12 feet with English veined Italian marble. Above this point the finish is Caen stone, which is modeled into bold decorative features. A series of columns on one side support the heavily beamed ceiling, and behind these columns French balconies project in front of the casement windows. This material and treatment is carried through the promenade foyer, the floors of marble mosaic are designed in keeping with the whole.

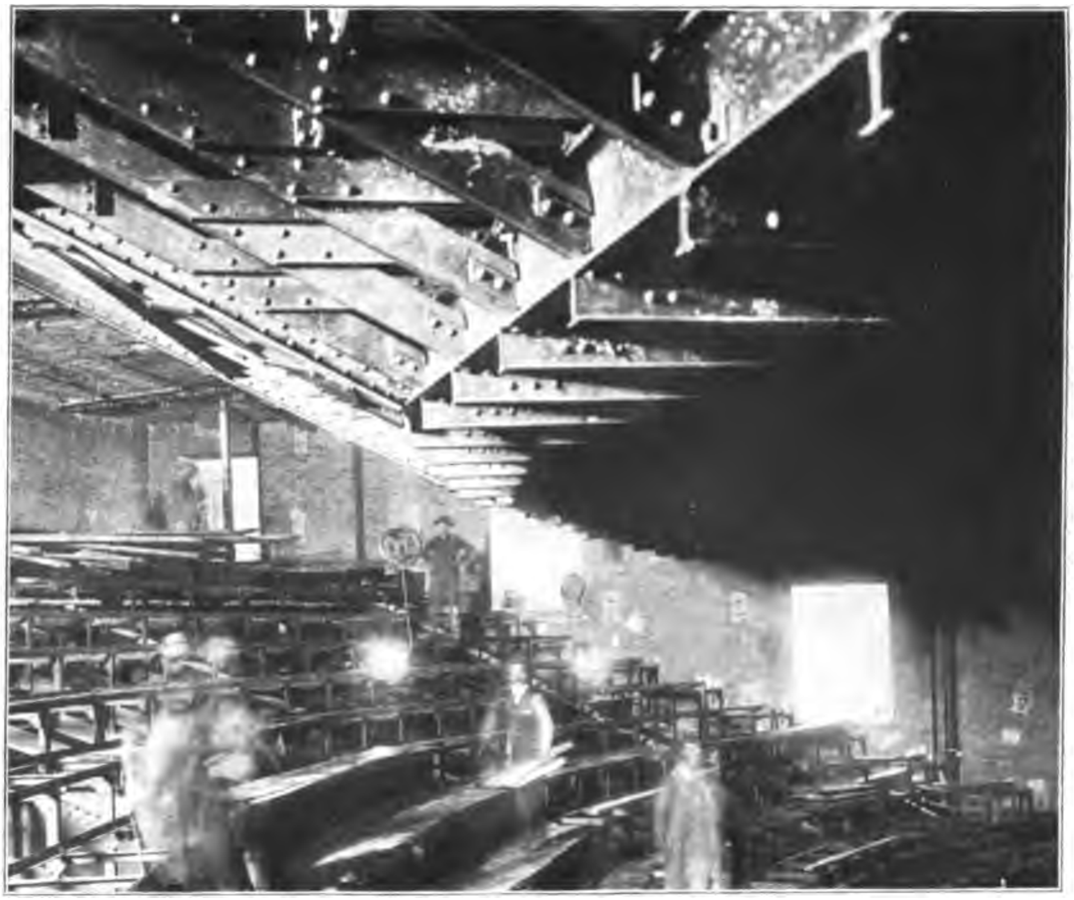


PLATE NO. 4—VIEW FROM BALCONY, SHOWING SOFFIT OF GALLERY AND FRAMING OF GALLERIES. MAJESTIC THEATER AND OFFICE BUILDING.
Edmund R. Krause, Architect.

One point we must not pass unnoticed, and this emphasis is perhaps from a view of comfort as well as beauty—the seating and arrangement of chairs. Perhaps it is not too bold to assert that no theater yet constructed has alloted such commodious seats to its patrons, and we will partly confess that this is due to the stringent but well-judged building laws. The widths of these seats vary from 22 to 24 inches, and the spacing from back to back is 2 feet 10 inches. These dimensions do not decrease in the galleries, where its patrons heretofore have been accustomed to the usual packing process. These seats have beautifully modeled cast-iron frames and are covered with short pile plush. The arms are mahogany.

The heating and ventilating has been studied and planned to such a degree that every part of the house will have the specified changes per hour, thus eliminating dead pockets and non-uniform circulation. The auditorium, foyers, retiring rooms, dressing rooms in basement, etc., are heated by a mechanical blast system, the apparatus of which is located in the sub-basement near to the fresh air shaft. This shaft extends a height of 300 feet alongside stack to the top of the building and provides an abundance of fresh air, which is carried over tempering coils through an air washer and eliminator. It is then discharged over heating coils into the Plenum chamber and supplied to the auditorium and other portions of the building. Automatically con-

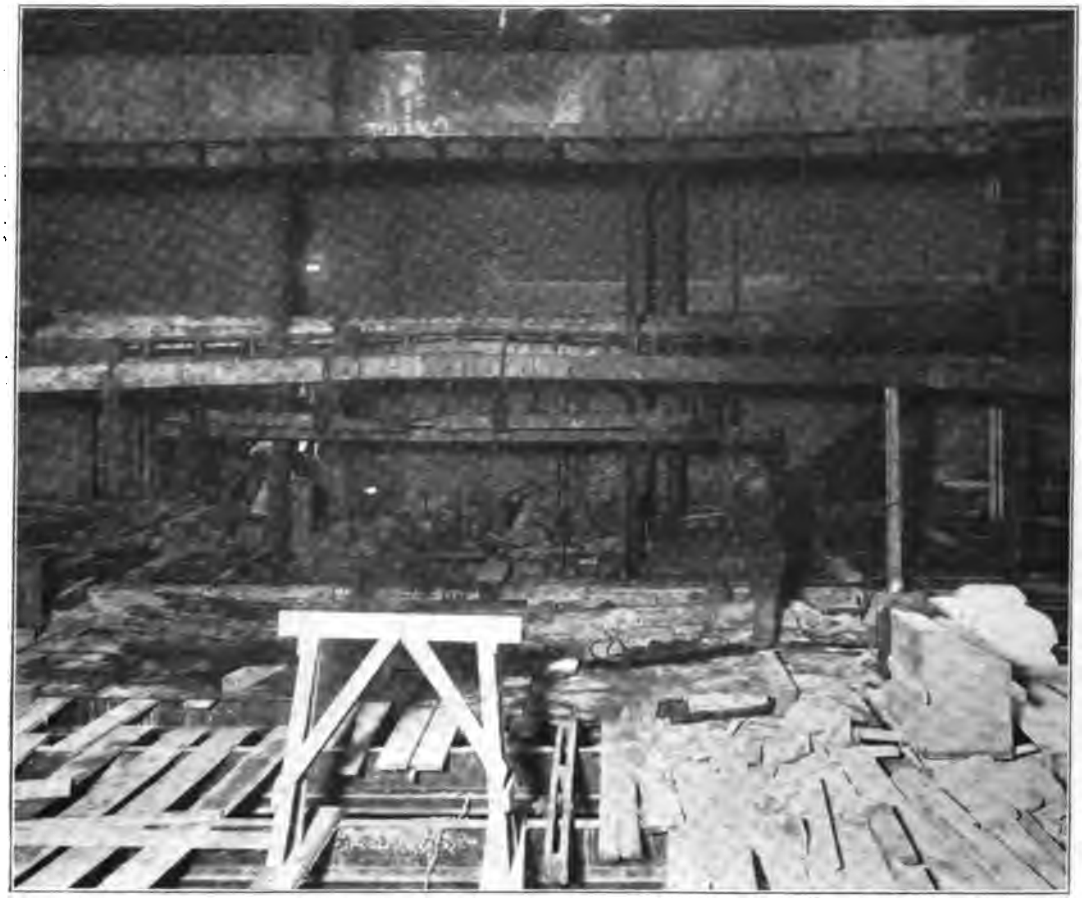


PLATE NO. 5—VIEW FROM STAGE, LOOKING TOWARD GALLERIES. AUDITORIUM IS 75 FEET IN WIDTH. MAJESTIC THEATER AND OFFICE BUILDING.
Edmund R. Krause, Architect.

trolled reheating coils are placed in the Plenum chamber, which is located in the basement, in order to regulate the temperature within two degrees of the point thermostats are set. Before this air is introduced into the Plenum chamber it is cleaned by passing through an air washer or spray chamber at a uniform velocity and volume, so that each cubic foot comes in contact with a given quantity of water, thus rendering saturation as complete as possible. It is then passed through an eliminator of sufficient capacity to handle 40,000 cubic feet per minute. Summing up, the apparatus is held under a guarantee to extract 98 per cent of all dust and foreign matter afloat and to deliver warmed air into all rooms in a normal state of humidity, also to cool the air during warm weather to within four degrees of the spray chamber.

In the attic over the auditorium an exhaust system of ventilation is installed, and this extracts 21,000 cubic feet of foul air per minute, discharging the same through ventilators above the roof.

A pneumatic exhaust cleaning system is installed throughout, thus eliminating the spread of dirt and dust, as in the old method of cleaning.

We may now spend a few moments on the portion of the theater of which little is known to the general public, but nevertheless all-important from every standpoint. The stage covers an area of 36 feet in depth by 75 feet in width, and the walls, 3

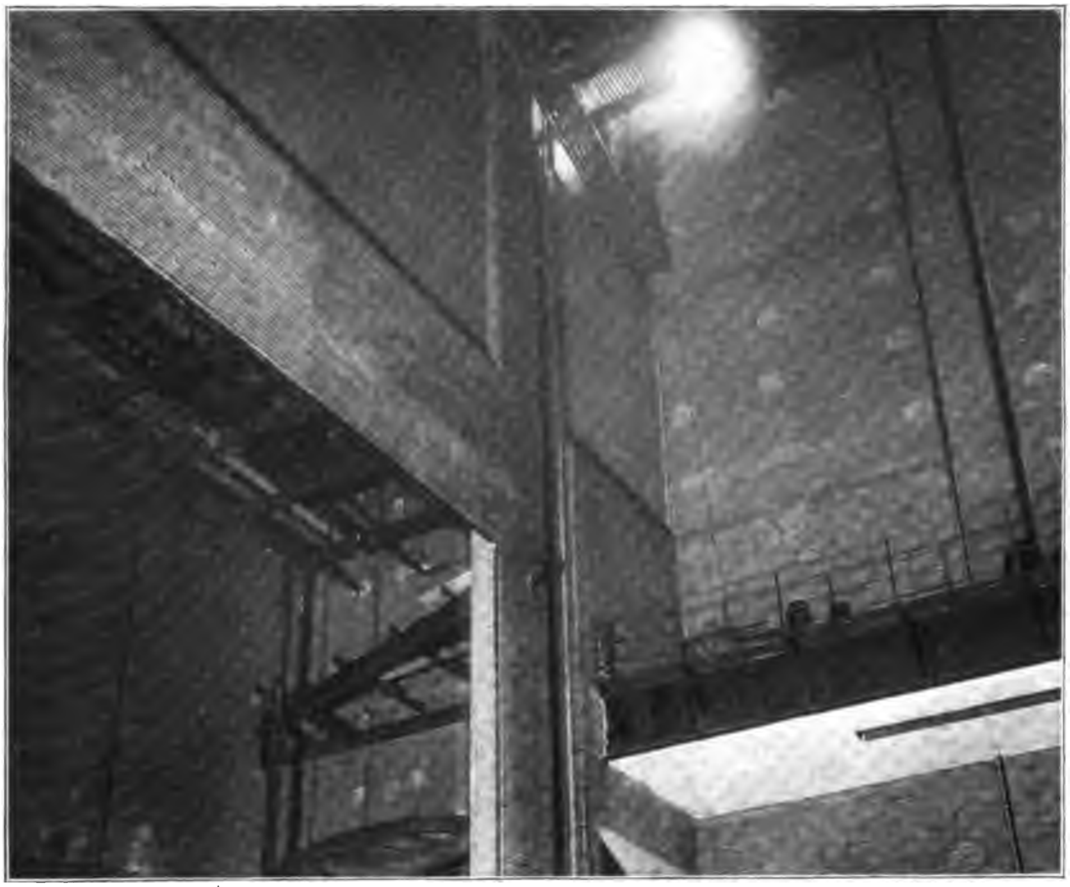


PLATE NO. 6—VIEW FROM STAGE, SHOWING PROSCENIUM OPENING, FLY GALLERY AND GRIDIRON. GRIDIRON IS 78 FEET ABOVE STAGE. MAJESTIC THEATER AND OFFICE BUILDING.
Edmund R. Krause, Architect.

feet in thickness, rise an unobstructed height of 78 feet to the steel gridiron. The steel floor beams are covered with a 2¾-inch quarter-sawed floor and so arranged that a trap may be cut of any dimension or location desired. On either side are stairways leading down to the dressing rooms, and on one side only an iron stair ascends to the fly galleries, gridiron and pent house. The plan will give a general idea of this arrangement, also the scenery and individual entrance doors. The switchboard is placed 8 feet above the floor level, and in such a position that the electrician may command a full and unobstructed view. In the rear and near to the scenery door a hydraulic trunk lift travels to the dressing room floor and basement levels.

The fly galleries are on either side of the stage at a height of 30 feet above the floor and extend the full depth. Twenty-four-inch plate girders extend from back wall to proscenium wall and receive the floor beams framed from the side walls. Tile arch construction is used in the floor with neat cement finish.

A steel paint bridge, 3 feet in width, connects the two fly galleries, and the floor is constructed by bolting 2-inch channels laid flat with 50 per cent opening.

The gridiron is entirely of steel and suspended from the roof girders. The slots for head blocks, rigging, etc., are formed with channels placed back to back, and laid on at right angles to these are 2-inch channels bolted flat 4 inches on centers.

At a height of 12 feet above the gridiron, and directly in the center of the stage, the brick ventilator is supported by plate girders. This ventilator is 16 feet square and has a damper on ball bearings. The electric closed circuit operating device is so constructed that the damper may be opened or closed to any degree by a cable leading down to the stage. In case of fire the circuit is broken by the throwing of a switch placed in an alarm box, and the damper automatically opens its maximum distance. These alarm boxes are placed on the gridiron, fly galleries and stage levels.

Built above the roof of the stage is the pent house, which contains the tanks for the sprinkler system, the standpipe and house tanks.

This elevation is at a level of 128 feet above the stage, thus giving a sufficient pressure for fire protection.

The first and all-important safeguard is the steel fireproof curtain. It is safe to assert that the designs and construction of these curtains have merely been passing through an experimental stage. Aside from possessing the heat-resisting qualities there are lateral pressures to be considered and it is scarcely within human power to form an accurate idea as to the intensity of such stresses. These conditions have placed before the engineers a problem difficult to handle. All tensile stresses can well be handled, but the lateral forces cause the curtain to perform the function of a beam with either side of the proscenium wall as its reaction. It is evident at once that the beam theory cannot be carried out, since such a beam would demand unreasonable depths, thus increasing the weight and thickness to a point of absurdity. In designing the Majestic curtain these theories were followed, and the lateral pressure is cared for as is mentioned later.

The skeleton framing consists of vertical T-irons 3 feet on centers, suspended from a 12-inch head channel. The sides and bottom are bound with lighter channels. Two and one-half-inch T's run laterally between these vertical T's and serve to receive the butt joints of the boiler plate facing. These plates are on the auditorium side and are securely bolted 6 inches on centers. The stage side of the frame is covered with sheets of vitrified asbestos and these sheets are not only bolted to the legs of the T's, but also to the steel plate facing.

The guides are a Z-bar construction, built of angles and bolted to the brick proscenium wall. They are so constructed that a lap is had on the rear of the curtain, thus protecting the maple guide strips and forming a fire stop from the auditorium.

Fastened to the face of the curtain, but back from the proscenium opening, are short angles placed about 6 feet on centers. To these angles are bolted ball-bearing rollers, which travel near to a continuous vertical angle held rigid by a lattice construction to the curtain guide proper.

If any lateral force should tend to buckle the curtain these ball-bearing rollers would come in contact with the vertical angle, which in turn would take up the strain and act as a guide. Such an action on the curtain would throw it in tension and hence give the members the proper forces to which they are best adapted.

On either proscenium column, at a point just below the level of the head channel of the curtain, are brackets extending out from the face of the wall about 9 inches. On these brackets are placed especially designed bumpers which receive this head channel, and checked up to such a height that when the curtain is at rest it clears the stage floor an inch. This device always insures the curtain of being in tension and prevents striking the stage floor, thus endangering the shearing of rivets and buckling.

To insure a perfect hanging, this curtain is suspended from six different points by ¾-inch steel cables which pass over the

42-inch sheaves on the gridiron to the counterweights on either side.

The electric motor is of 7½ horsepower capacity and is placed in the basement. It is so constructed that in case of failure of electrical power the drum may be operated by hand, giving a sufficient speed to raise or lower the curtain as is desired.

At different points on the stage are placed emergency switches inclosed in glass boxes, the front of which must be broken when access is desired. These switches are push buttons which will lower the curtain only as the circuit is held closed. When this occurs an alarm bell and red light placed on the switchboard, and also on the opposite side of the stage, give warning of the descent.

The main control is placed on the switchboard and gives any speed desired up to 150 feet per minute.

The star dressing rooms are located just beneath the stage on either side, and, going on down the stair, we land at the general dressing room floor. The partitions of these rooms are of wire lath and hard plaster 8 feet in height. The floors are tile arch construction and cement finish, thus insuring cleanliness from a sanitary point of view. The supers, electricians, musicians and animal rooms are under the star dressing rooms and have the cement finish throughout.

This entire basement is thoroughly protected by a sprinkler system, as well as the standpipe and hand appliances for fighting fire.

From this general description of the building we can form an idea as to its fireproof qualities. The only combustible materials in use are the maple floors and wooden floor strips. These can hardly be considered a hazard, since the strips are completely bedded in the concrete, and with the floors in place there is no air space between the latter and the concrete.

Again the term fireproof suggests to the layman a sense of safety, but the plan and general means and direction of escape are of equal, if not of greater, importance to insure such a result.

The Chicago building ordinance governing theaters hereafter built demands a general arrangement of plan, position and capacity of exits, stairways, etc., which well cover this point.

CURRENT OPINION FROM VARIOUS SOURCES

WHAT IS FIREPROOFING?

D. T. Pierce in *Public Opinion.*

The underwriters are working for the adoption of model building codes in all cities having a population of 7,500 or more, the object being to bring about an era of fireproof building.

While we are waiting for the day when all cities have model building regulations, carefully framed with a view to reducing the fire hazard to a minimum, it will save millions if we consider what can be done now to render dwellings, skyscraper and public buildings as safe as possible from destruction by fire. One step in this direction would be the education of the public as to what "fireproofing" really means.

A fireproof building is one in which the structural parts are non-inflammable, and so protected that they will pass through any probable degree of heat without collapse or material injury. Exposed steel is not fireproof. Concrete floors and ceilings are not fireproof if the concrete is made partly of cinders, and yet this sort of construction which we see going on around us every day is loudly vaunted as affording perfect protection against fire. A mixture of five parts of cinders and one part of cement is not a fireproof material, for the simple reason that when subjected to the test of severe heat it becomes incandescent and crumbles under the weight imposed upon it. The reason for emphasizing this point is that nine people out of ten look upon the masses of cinder and cement laid in fireproof buildings as a thoroughly satisifactory protection.

As a practical matter, considering materials and the manner in which they are handled by builders, the only form of fireproofing actually fireproof is that which is subjected in the process of manufacture to the same tests it will undergo in case of an actual conflagration. Hollow tile or terra cotta is the only material that fills all requirements. It is manufactured at 2,500 degrees, and its great advantage as compared with other systems of fireproofing has been shown over and over again.

ADULTERATION IN CONCRETE

(From the *New Buffalo Times.*)

Mr. D. T. Pierce says "concrete floors and ceilings are not fireproof if the concrete is made partly of cinders." True, and he might go further and assert with equal truth that concrete with cinders in it is no more concrete than horseradish condiment is horseradish when it is made up with turnip in it.

Concrete is concrete only when properly made. Adulteration in that material is the same in principle as putting any kind of "dope" into food products. It is necessary to start fair if there is to be any intelligent discussion of the question of fireproofing in building work. Concrete is not concrete in any true sense when it is partly cinders. When a material is certainly fireproof in its proper composition any mixture with it that destroys its fireproof quality is enough to take away also the name the product bears when honestly and intelligently made.

No doubt cheating goes on in concrete mixing as in about everything else that men sell and buy. But as long as it is easily practicable to get genuine concrete it is fair to base discussion of the nature of it on the assumption that it is real concrete that is talked about under such circumstances. Mr. Pierce is an advocate of hollow tile construction, but that material is not to be mentioned in comparison with concrete, valuable as the tile is in many places.

It is one of the signs of our advancing civilization that much attention is given to fireproof construction. The fire losses of the United States cost enough to rebuild the business sections of the principal American cities every ten years. Nearly all of it is due to construction out of combustible materials. Universal resort to fireproof materials must reduce fire losses to an insignificant figure, and all the more quickly when it is once lodged in the heads of mankind that fireproof construction is cheaper than any other kind, even in the first cost.

NEW BUILDING CODE

REVISION COMMISSIONER'S JOB WELL UNDER WAY.

(From the *Baltimore News.*)

The commission having in charge the revision of the building laws of the city has its big job pretty well under way.

Special stress has been laid by the members of the revising commission upon the provisions that relate to the construction of theaters and public halls, where large audiences gather and where protection against fires and panics is the most important consideration, or should be. The new code will be very emphatic in regulating the construction of the theaters. One of the most radical provisions is to the effect that no theater or public hall shall be built without open spaces on all sides. Whether this will in any way affect theaters already built remains to be determined. The new code also contains very specific provisions about fire escapes, aisles and fireproofing generally. The aim has been to make places where the public gathers in large numbers as safe against fire and panic as the law can make them. And Inspector of Buildings Preston declares that the new laws, when put into effect, will be enforced to the letter.

It is declared that all of the provisions in the code are based upon common sense. No startling changes have been made. No concrete building will be permitted to be raised over 100 feet in height. Buildings over 100 feet in height must be thoroughly fireproof, with steel framework and metal sashes. The limit for fireproof buildings will be 175 feet, while buildings not fireproof must not be higher than 85 feet.

One of the newest features of the revised building laws will be a provision for the inspection of all plumbing work in newly erected buildings by the building inspector. This work heretofore has been done by the commissioner of health. This inspection will be continued, but Mr. Preston will make his inspection from the mechanical point of view to see if the plumbing has been done properly and according to the demands of the building.

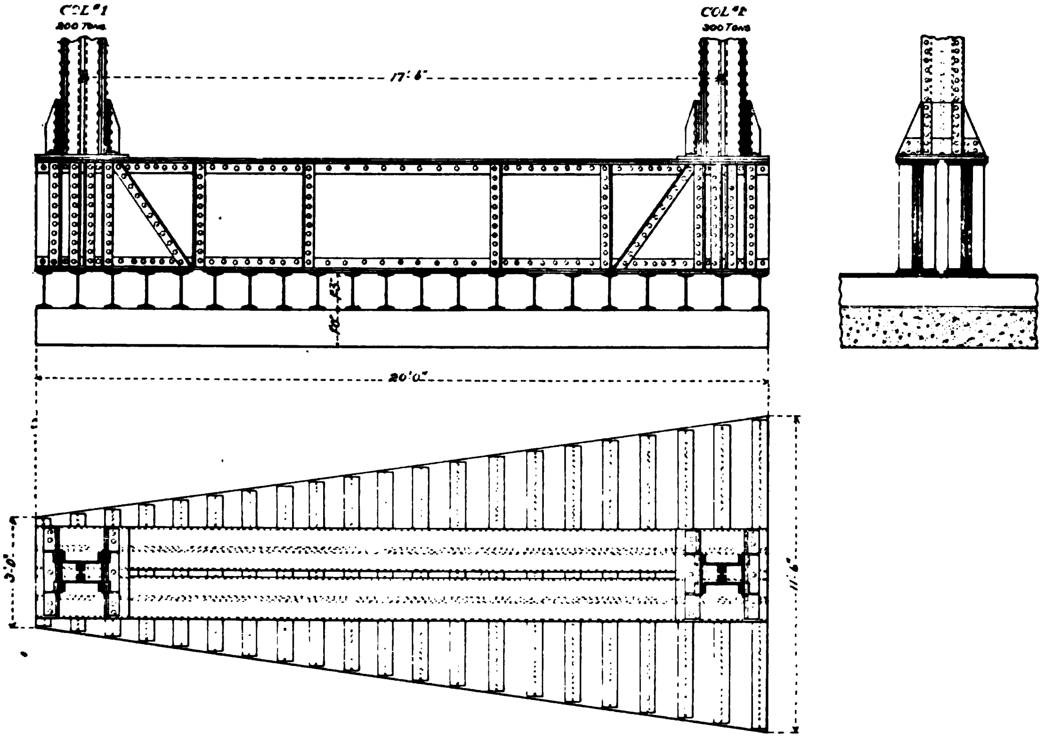
The commission is composed of Mayor Timanus, Mr. Preston, City Engineer Fendall, Mr. Paul Turner, insurance expert; Mr. John Waters, builder; Mr. J. Evans Sperry, Mr. Francis H. Kelly and Mr. T. Corydon Purdy.

FOUNDING WITHOUT CANTILEVERS

BY W. I. PARRY.

IN the designing of city buildings the question of the adjoining lot line or party wall privileges is one that always demands consideration. This feature is not eliminated even where the privilege is given of encroaching on the neighbor's wall line for foundation or footing purposes, for, even with this liberty, the question of what loads the foundation shall be designed to carry is difficult, if not impossible, of satisfactory solution, and the adoption of a party wall, instead of helping, often only adds to the difficulties of the situation and it has led to many misunderstandings and lawsuits. A comparatively recent instance, which occurred in Pittsburg, was the disagreement between the builders of the Farmers' Deposit Bank, a 24-story building, and its adjacent neighbor. Here existed the party wall right and the erectors of the new building contended that a steel frame sufficient for a similar building to their own would be sufficient, while, on the other hand, their neighbor argued the possibility that at some future time it might be decided to build their own building perhaps 10 stories higher, or even more than that, than the bank building. The result of the disagreement was that no party wall was built, instead of which the large Farmers' Bank building was constructed with its own steel frame, independent of any future building that might be erected beside it, and this, after all, seems the best and most logical way to handle this ugly question, for, even where it could be amicably arranged on the lines suggested of a frame sufficiently strong for another building of a similar character, the unequal founding of the building due to allowing for these possible loads of the dim future, could not fail on some qualities of earth to produce unequal settlement of the building, with all its consequent unsatisfactory, if not disastrous, results.

In most cases, therefore, it would seem the better policy, where there are adjoining buildings, to make the frame of the structure under consideration entirely independent of any of its neighbors. To effect this some form of cantilever will be necessary, and, that being true, the simplest form will generally be the best. The ordinary type of cantilever girder is based upon the theory of a knife-edge fulcrum, which theory is more often violated than adhered to in actual practice. The correct theoretical cantilever girder should be of that type where the pin is used as the fulcrum and the girder rests on the pin through the medium of a concave fulcrum, the pin being supported similarly by the fulcrum footing. This usually means expensive and careful work, and instead of this method, the more usual treatment is to simply allow the girder to rest upon the top course of the footing beams, which is usually made up of three or four beams. As a matter of fact, this will produce a greater bearing stress upon the outside beams, and, to overcome this the best designers either make these outside beams much heavier than the inside or else, in order to insure that these beams will be heavy enough to take whatever stress is brought to them, make the entire upper footing much heavier than actually required. Besides all this the cantilever girders themselves should be designed and built with care, and the arrange-



ment of stiffeners carefully watched so that whatever stresses there may be can be properly brought to the bearing points.

Taking all these conditions into consideration, it would seem that the use of spread footings and equalizing girders was the simplest method of taking care of these loads, which reach the footing eccentrically and quite as efficient as any other means. For example, the accompanying drawing illustrates a case where the unequal loads of two columns are distributed to the foundations and made to balance each other through the medium of grillage or a footing of the raft type of trapezoid shape and an equalizing girder. In order to secure an equal distribution of these two loads, it is necessary to make their center of gravity coincide with the center of pressure. In the case shown in the drawing we have from column No. 1, on the left, a load of 200 tons, and from column No. 2 on the right, a load of 300 tons. By formula we find that a trapezoid with a length of 17.5 feet, the distance between column centers, will require sides of 2.857 and 11.428 feet respectively in order to make the center of gravity of the loads and the center of pressure coincide, and, for the sake of ease in figuring, these dimensions have been made 3 feet and 11 feet 6 inches in our design, which is an error on the side of safety.

In designing our equalizing girder we simply consider the conditions reversed and have a girder supported at two points with an unequally distributed load, this load or series of loads being based upon the area of each longitudinal foot of the footing multiplied by the constant of earth pressure decided upon. The girder shown in the drawing is really a pair of single-web plate girders connected at the column bearing points by plates, and also by diaphragms, which is the better practice and the one generally used now for girders of the cantilever genus or type, as the use of this type makes it much easier to reinforce the webs sufficiently with stiffeners or extra plates to take care of any shear or buckling effect that would naturally exist under the columns.

The grillage beams themselves are figured as the ordinary footing beam, considering the reaction or earth pressure resisting the load carried. In this case, it will be noticed the beams are 15 inches in depth, which depth has been determined by the worst case where the largest beam is required. It will, of course, be understood that where the beams are shorter they may be of less strength, although for unity of design it would be better practice to adhere to the same depth of beam at least, even if lighter weights of this section are taken.

It will readily be appreciated that where the two column loads are equal the grillage would be rectangular in shape, the trapezoid form being used simply to make an even distribution of the unequal loads over the entire footing. The method described is applicable to and based upon the grillage or raft type of foundations, which still holds its place as the most popular method of founding, although in New York and also in Chicago (where it first saw the light of day and the sun of popularity) it has given place in very many cases to the more elaborate and expensive caisson. Many of the greatest apostles of the grillage system have gone over to the deep caisson, on account of the general uncertainty of the sub-soil of Chicago, with its quicksand-like quality.

Yet it is doubtful if the grillage will ever be superseded by any other method where the character of the earth is ordinary and reliable, so that, notwithstanding the present tendency toward caisson or deep pier foundations, it is likely that the raft or grillage footing will hold its place for many years to come, and the method here described may be used in many ordinary cases of founding with considerable advantage over the cantilever girder, and it is recommended by its simplicity of workmanship and design. [Experiences at Chicago have recently demonstrated that the caisson (or, as it is there called, the "well" foundation) is a necessity for reasons other than those advanced by the writer. The construction of the underground system of tunnels, 40 feet below the street grade, for freight transportation, first introduced in that city, has made it necessary to carry foundations below that point, not only for safety against any movement of the clay, but to facilitate the sinking of shafts under buildings to connect with these tunnels.—Ed.]

A NEW FIELD

THE FIRST NATIONAL BANK BUILDING, UNIONTOWN, PA.

BY J. C. C. HOLDING.

STEEL frame buildings have always been associated in our minds with large cities, and the word "skyscraper" has suggested visions of hurrying thousands of busy men and women crowding the streets at the building's base. Such structures have been essentially a city proposition, because one of the reasons for the existence of the modern skyscraper is the necessity for economizing ground space in localities where business interests are concentrated. While this condition is, of course, most emphasized in large cities, it exists to some extent in almost every community and, although this consideration alone might not be sufficient for the erection of a modern steel frame, fireproof building in a town of, say, 20,000 inhabitants, there is no reason why the many other features in its favor should not appeal to progressive business men and investors.

The First National Bank building of Uniontown, Pa., completed during 1902,* furnishes a conspicuous example of just such an enterprise. Uniontown has less than 10,000 inhabitants. It has railroad connections with but two prominent lines, being located on branches of the Baltimore & Ohio and of the Pennsylvania system about seventy miles south of Pittsburg. It is the county seat of Fayette County and is surrounded by a fertile farming country which is underlaid with vast strata of coal. This last fact is chiefly responsible for its very existence and is the secret of its present prosperity. It has no industry of importance outside of those directly connected with bituminous coal, but, on account of the great value of the adjacent coal lands which have been its stock in trade, many fortunes have been made there, and consequently it now has more than its share, possibly, of wealthy citizens.

"The Skyscraper," as the new First National Bank building is commonly called by the town people, is located at the corner of Main and Pittsburg streets. It was built by the First National Bank of Uniontown, of which Mr. Josiah V. Thompson is president. It is irregular in shape, as shown by the accompanying floor plans, having a frontage of 145 feet on Main street, 68 feet on Pittsburg street and a total depth of 102 feet. D. H. Burnham & Co. of Chicago were the architects and James A. McGonigle of Leavenworth, Kan., was the general contractor.

The building consists of eleven floors, basement and attic, built after the most approved pattern of modern steel frame construction, and is considered absolutely fireproof throughout. The exterior finish is of solid granite up to the third floor and of buff brick and terra cotta above that level.

The interior finish is handsome and expensive, all corridors and toilet rooms being wainscoted in marble and having floors of mosaic tile, while a staircase with marble treads runs from basement to attic.

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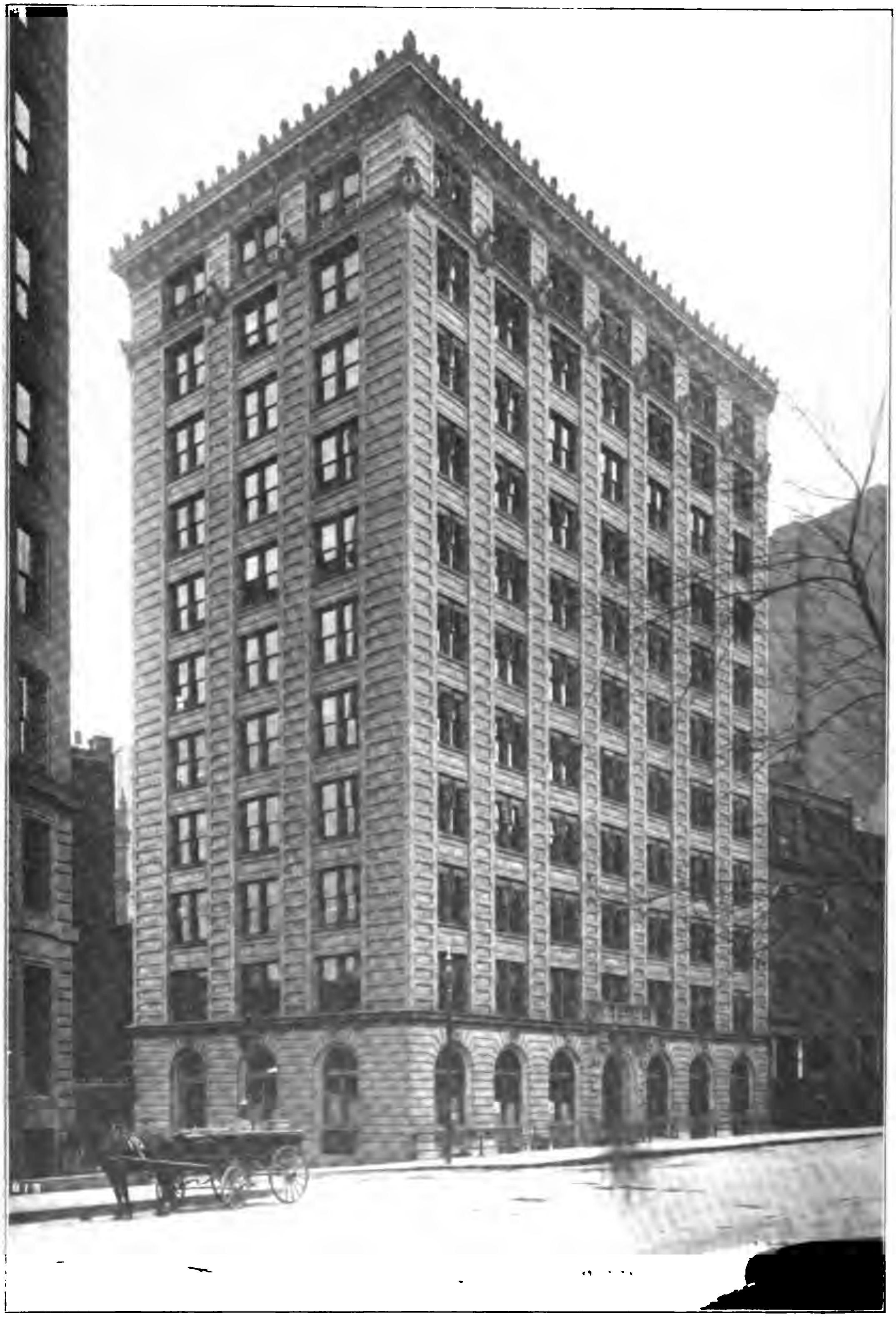
* See Frontispiece.

The first floor is occupied by the First National Bank and seven store rooms of various descriptions. The fourth, fifth, sixth and seventh floors are arranged exclusively for offices and portions of the second and third are devoted to the same purpose. A handsome lodge room occupies a part of the third floor. The eighth, ninth and tenth floors, together with the remaining portions of the second and third, are divided into living apartments, which are unsurpassed in the elegance and convenience of their appointment.

One feature of the building which is more or less novel is the arrangement of the eleventh floor. This floor is divided into suites of from four to eleven rooms each, suitable for families desiring kitchens, dining rooms, etc., with all the modern conveniences of city apartments. There are separate entrances to the building for the apartments and the offices and adequate elevator service is provided for both.

The building is well filled with tenants at all times, as it is the favorite location for offices of professional men, coal companies, real estate brokers, etc., while the convenience and elegance of the apartments and flats have attracted many families. The point of greatest interest in connection with the whole enterprise is the fact that, according to reliable information, the project pays in the neighborhood of 5 per cent on the investment. While this is not equal to the percentage realized on some city skyscrapers, yet when we consider the fact that the small town is an entirely new field for this class of buildings, and remember that even in a congested city like Pittsburg the first skyscraper was a complete financial failure for several years, it seems safe to prophesy that in time this Uniontown building will prove to be as successful a moneymaker as if it were located in the heart of a great city.

It may not be good logic to deduce general conclusions from an isolated case, as the wealth and enterprise of individual citizens always govern in matters of this kind, but one successful venture serves at least to direct our attention to this new field for the skyscraper, and it will not be surprising to find in the near future the larger towns imitating their city neighbors in the character of their buildings. We shall not expect, of course, to see a twenty-two-story building in a town of as many thousand people, but substantial steel fireproof buildings of greater height than has heretofore been customary are undoubtedly destined to become more common outside the great cities.



FIREPROOF ARCHITECTURE IN BOSTON—PEMBERTON BUILDING, PEMBERTON SQUARE.
Fehmer & Page, Architects.

FIRE TEST OF AMERICAN FLOOR ARCHES IN LONDON

OFFICIAL REPORT OF THE BRITISH FIRE PREVENTION COMMITTEE.

FIRE TEST NO. 69—JUNE 28, 1905.

A FLOOR BY THE NATIONAL FIREPROOFING COMPANY, PITTSBURG, U. S. A., AND LONDON.

OBJECT OF TEST.

To record the effect of a fire of four hours' duration, the temperature to reach 1800 degrees F. (982.2 C.), but not to exceed 2200 degrees F. (1204.4 C.), followed by the application of water for five minutes, with a view to classification under "Full Protection" (Class B).

Note.—The area of the floor under investigation was to be at least 200 feet sup. (18.58 sq. m.). The floor was to be loaded with 280 lb. (127 kg.) per foot (.3 sq. m.) distributed.

The time allowed for drying was twenty-eight days (summer).

SUMMARY OF EFFECT.

Small patches of plaster flaked off the soffit of the ceiling during the test.

On the application of water the plaster to the soffit of the floor where struck by the jet was washed off.

The maximum deflection of the floor during the test was ⅜ inch (.0095 m).

The fire did not pass through the floor.

On the removal of the load the upper surface of the floor was found intact, but for one crack at the northwest end (see Fig. 9), and there was no permanent deflection.

DESCRIPTION OF TESTING PLANT.

The testing chamber was located at the committee's new testing station and was known as "No. 2 Hut."

The chamber was constructed as shown, of stock bricks, with lime mortar, and measured 10 feet by 22 feet 3 inches (3.05 m. by 6.78 m.) internally.

The ceiling of the floor tested was 8 feet 3 inches (2.51 m.) above the pavement of the chamber.

The hut was temporarily covered with tarpaulins.

The door-openings on the north, south and east sides measured 2 feet by 6 feet (.61 m. by 1.83 m.), and were closed by being filled in with brickwork, 4½ inches (.114 m.) thick.

The fuel used was gas produced at the station, and the supply was regulated by valves and dampers.

The gas was admitted through four mixing chambers of firebricks, each 10 feet by 3 feet (3.05 m. by .91 m.), as shown.

Two Roberts-Austen pyrometers were used for recording temperatures, the first to take a continuous record from point 10, and the second to take observations from points 1 to 9.

The load of bricks was distributed on the surface of the floor in four piles.

There were four observation holes in the west wall, one in the south wall, one in the north wall, and two in the east wall, the last four being formed in the bricked-up door-openings, each covered with a movable iron shutter.

The draught holes were in the west, north and south walls.

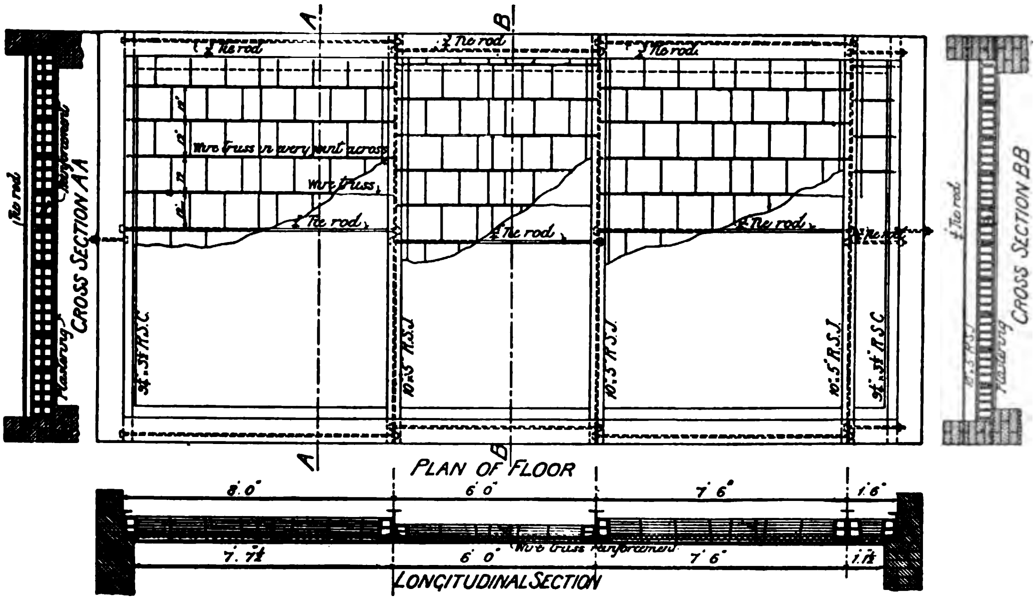


FIG. 1—THE FLOOR PLAN AND SECTIONS.

The photographs were taken by daylight and by flashlight.

Water was applied through a branch with ¾-inch (.02 m.) nozzle supplied from a small steam fire engine.

CONSTRUCTION OF THE FLOOR.

(See Figs. 1 and 2.)

The construction of the floor, illustrated in Figs. 1 and 2, was as follows:

The floor was divided into four bays of the following widths, viz., 7 feet 7½ inches (2.32 m.), 6 feet (1.83 m.), 7 feet 6 inches (2.29 m.), and 1 foot 1½ inches (.34 m.), respectively.

On the set off on the north and south wall of the hut 3½ by 9¼ (.09 m. by .23 m.) channel irons were placed, weighing 25 pounds (11.33 kgs.) per foot run (.30 m.). These were secured to the brick parapet by a short bolt through the center and terminated on the outside of the parapet by a cast-iron washer.

Three steel joists 10 inches by 5 inches (.25 m. by .13 m.), and weighing 30 pounds (13.60 kgs.) per foot run (.30 m.), were placed on the set-off of the hut, dividing the space to be occupied by the floor into the four bays of the widths above described.

There were three tie-rods ¾ inch (.02 m.) diameter to each bay, one in the center and one at each end.

Wooden centering was fixed 1½ inch (.04 m.) from the bottom flanges of the steel joists.

The floor was constructed of hollow terra cotta blocks, described as "semi-porous."

Soffit slabs of similar terra cotta 1¼ inch (.03 m.) thick were placed under the bottom flanges of the steel joists and on either side skew-back blocks were fitted (see detail Fig. 2); the blocks forming the general body of the floor measured in the three outer bays 12 inches by 6 inches by 8 inches (.30 m. by .15 m. by .20 m.) in depth, and in that of the center bay 12 inches by 6 inches by 6 inches (.30 m. by .15 m. by .15 m.) in depth. The blocks forming a series of flat arches with a key block in the center. The blocks were cemented together with Portland cement and clean sharp sand in the proportion of three parts of sand to one part of cement.

In the vertical joints between each row of blocks forming the arch from joist to joist was placed a metal reinforcement, consisting of a trussed band of mild steel wire 1¼ inch (.03 m.) deep, woven and interlaced (see Figs. 1 and 2). The wire was of two thicknesses, viz., 11 and 14 gauge. The metal reinforcement was not fastened to the joists, but merely built in with the blocks about 1 inch from the soffit.

The top surface of the arch was rendered with the cement mortar and the soffit was plastered with "seraphite" plastering in three coats, the thickness being about 1 inch (.025 m.).

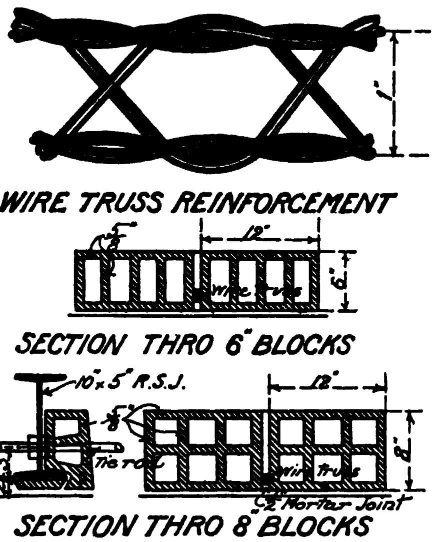


FIG. 2—DETAILS OF THE FLOOR.

The dimension from the underside of the steel joist to the soffit of the plastering averaged 2¼ inches (.157 m.).

The fixing of the terra cotta blocks was commenced on May 16 and completed on May 20. The centering was removed on May 22, and the plastering was commenced on May 23 and completed by May 28.

PREPARATIONS FOR TEST.

During the week preceding the tests the floor was loaded with stock bricks equal to a distributed load of 280 pounds (127 kg.) per square foot.

The tarpaulins were finally removed on the morning of the twenty-eighth of June before the test began.

THE TEST.

On June 28, 1905, the test was undertaken. The following is a log of the test:

At 3 p. m. the meteorological observations taken at the Botanic Gardens, Regent's Park, read as follows:

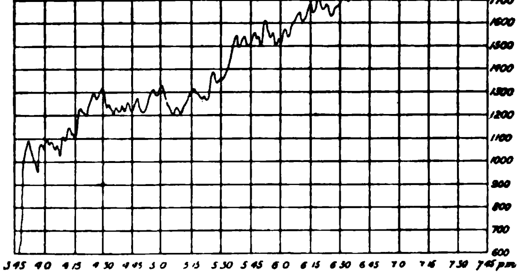
"State of weather, cloudy; wind S. W.; barometer, 29.77 inches; attached thermometer, 69 degrees F. (20.5 C.); dry bulb, 72.5 degrees F. (22.4 C.); wet bulb, 62 degrees F. (16.6 C.). Remarks: Fine afternoon."

The table shows the temperatures taken from the nine pyrometer observation points in the hut.

	Minutes Elapsed.
3:45 p. m. The gas was lighted.	
4:30 p. m. A small blister appeared in plaster of ceiling, about one-third from south end	45
4:37 p. m. The plaster had flaked off in small patches in several places	52
7:45 p. m. Ceiling was covered with hair-cracks	240
7:45 p. m. The gas was shut off	240
7:47 p. m. Water applied at a pressure of about 65 lbs. through a branch with a ¾ in. (.02 m.) nozzle. The effect of this was to wash away the plastering from the soffit of the floor where struck by the jet	242
7:52 p. m. The water was turned off. The fire and water had not passed through the floor	247

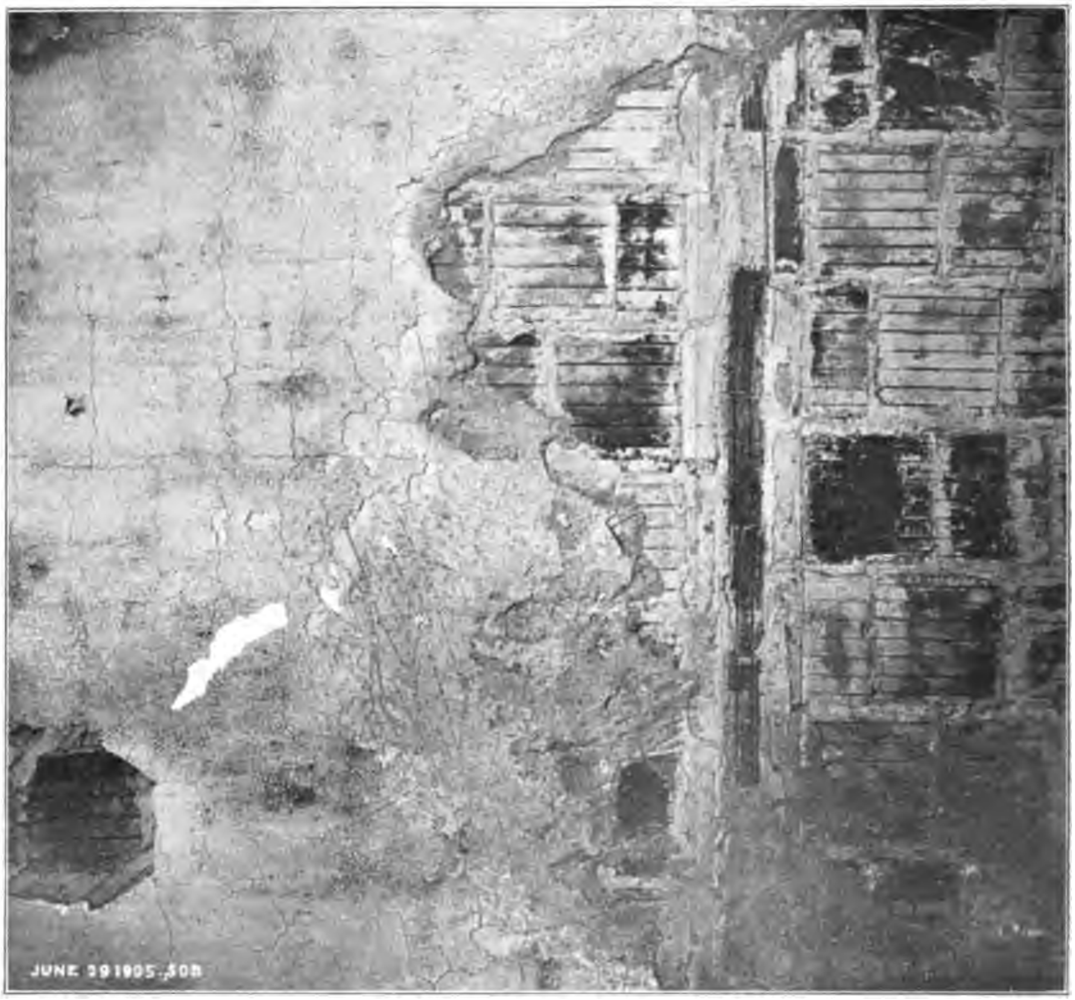
TEMPERATURES.

The continuous record (Point No. 10) read as follows:—



DEFLECTION OBSERVATIONS.

The deflections of the steel joists were taken by a level placed on the roof of an adjoining hut,



FIGS. 3 AND 4—VIEW OF FLOOR

and wooden staffs were placed on the centre of each steel joist, the readings being taken every five minutes during the test.

The deflection never at any point during the test exceeded ⅜ in. (.009 *m.*)

TABLE SHOWING DEFLECTIONS OF STEEL JOISTS.

Time.	Point No. 1.	Point No. 2.	Point No. 3
P. M.	Inch.	Inch.	Inch.
3:50	0	0	0
4:10	0	0	0
5:15	0	0	0
5:45	0	+⅛ (.003 *m.*)	+⅛ (.003 *m.*)
5:50	+⅛ (.003 *m.*)	+⅛	+⅛
6:20	+⅛	0	0
6:25	0	0	0
6:50	0	−⅛	0
7:00	−⅛	−⅛	−⅛
7:05	−⅛	−⅛	−⅛
7:10	−⅛	−3/16 (.004 *m.*)	−⅛
7:20	−⅛	−¼ (.008 *m.*)	−¼
7:35	−⅛	−5/16 (.007 *m.*)	−¼
7:45	−⅛	−⅜ (.009 *m.*)	−¼

OBSERVATIONS AFTER TEST.

(See Figs. 3, 4 and 5.)

On June 29 and July 1 the photographs shown in Figs. 3 and 4 were taken.

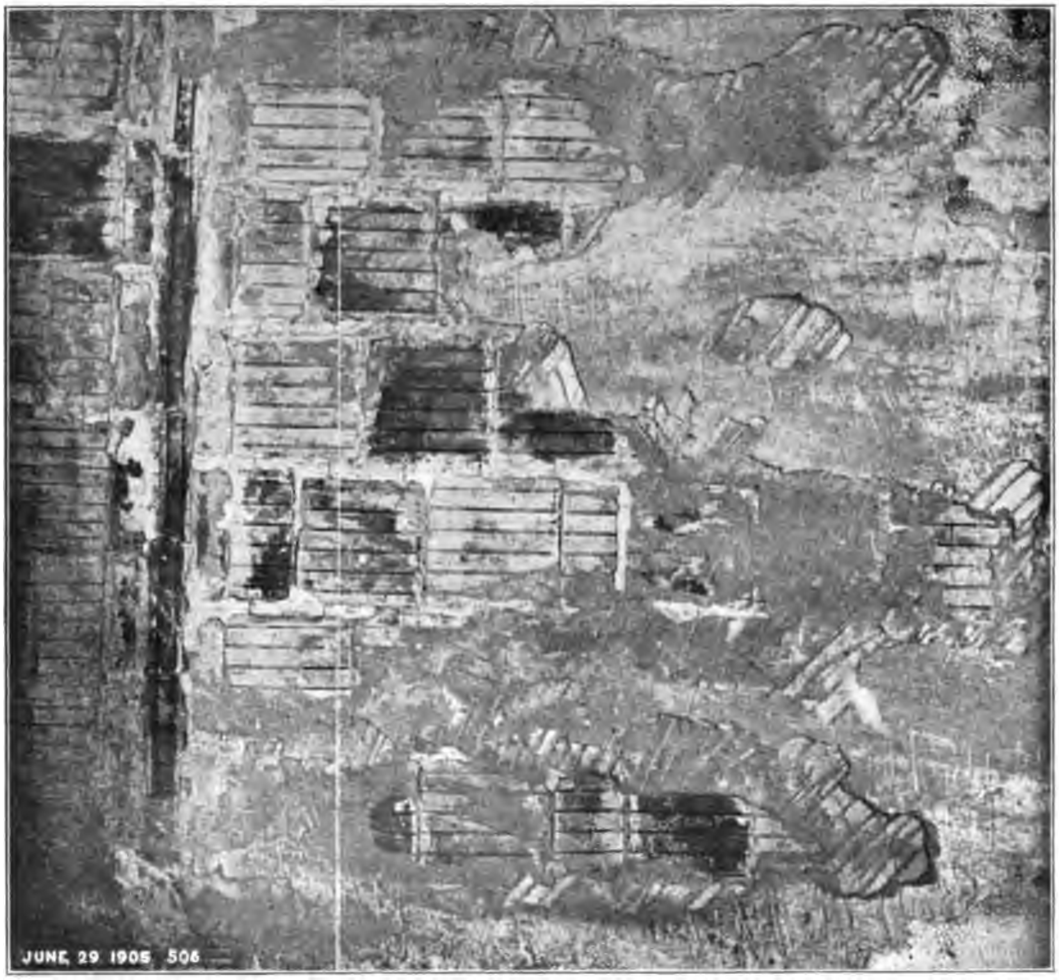
On July 1 the load was removed.

The surface of the top of the floor showed a slight crack in the northwest corner.

The plaster on the soffit of the floor was washed off where struck by the jet. The remainder was friabe and covered with cracks.

The semi-porous terra cotta blocks forming the floor were intact.

There was no permanent deflection of the floor after the removal of the load.



AFTER TEST (FROM BELOW).

The fire had not passed through the floor.

GENERAL ARRANGEMENTS.

The Test was carried out according to the procedure laid down by the Executive for investigations of this description, and was conducted by a Sub-Committee of the Executive comprising:—

Mr. Ellis Marsland (District Surveyor, Camberwell), *Directing Member.*

Mr. J. Herbert Dyer (Vice-President, National Fire Brigades Union).

Mr. Oswald C. Wylson, F.R.I.B.A.

Mr. William Grellier, F.R.I.B.A. (District Surveyor, Clapham).

Mr. A. H. Lister assisted the Sub-Committee.

Mr. H. B. White, M.Inst.E.E., superintended in the instrument room, with two assisstants.

The Council was represented for the testing operations of June 28th by—

Sir W. Henry Preece, K.C.B., F.R.S.

The Executive was represented for the testing operations of June 28th by—

Mr. Edwin O. Sachs, F.R.S.Ed. (Chairman).

Mr. Percy Collins.

Mr. Max Clarke, F.R.I.B.A.

Mr. James Sheppard (Surveyor, North British and Mercantile Insurance Company.)

The General Body of Members was represented for the testing operations of June 28th by—

Messrs. Walter Dewes, F.R.I.B.A.; E. J. Fulkes (Royal Insurance Company); S. G. Gamble (Divisional Officer, London Fire Brigade); Matt. Garbutt, F.R.I.B.A.; Frank W. Macey; Jos. Randall; Lieut.-Col. Winn, R.E.; Commandant Welsch (Ghent).

The National Fireproofing Company were represented by—

Messrs. J. F. Cummings, H. Thornton.

The following visitors attended at the Testing

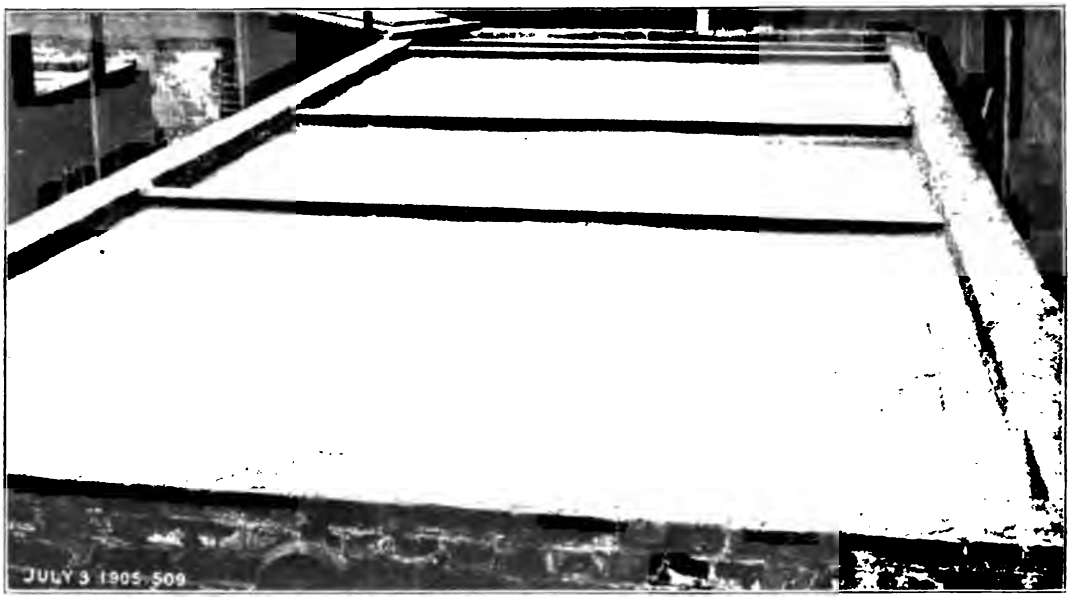


FIG. 5—THE FLOOR—VIEW AFTER TEST (AFTER LOAD REMOVED).

Station, by special invitation of the Executive, during the testing operations of June 28th:—

Messrs. J. Atherton; F. J. Ball; E. F. Cassel; H. K. Dyson; E. Faber; J. Ferguson; Wm. Goslet; A. S. Gibbs; T. E. Healy (Royal Insurance Company); Percy Hastings; F. W. Jackson; Howard Mercer; H. A. Matear; J. W. Newton; F. Nicholson; *N. G. Pennington; W. Peacock; Geo. Stubbings (Superintendent Fire Brigade, Great Eastern Railway); *Sir Thomas D. Pile, Bart.; Joseph Sabey; Thomas G. Wilson; J. C. Workman; and two representatives of the Superintending Architect, L.C.C.

Signed,

For the Sub-Committee Conducting the Test:

ELLIS MARSLAND (Directing Member).

For the General Testing Arrangements Sub-Committee:

J. HERBERT DYER.

For the Executive:

JAMES SHEPPARD.

Published by the Committee as directed by the executive.

C. F. ADAMI, (Assistant Secretary).

Date—July 26, 1905.

Verified a true copy of the report ordered to be published.

ROSE, INNES, SON & CRICK (Solicitors).

Date—August 3, 1905.

NOTE BY THE GENERAL HONORARY SECRETARY.

This test is of unusual interest, as it is the first test made by the committee with the fire-resisting floor constructed of "semi-porous" terra cotta blocks with steel wire reinforcement.

ELLIS MARSLAND.

July 20, 1905.

MORE RAMBLINGS

BY F. W. FITZPATRICK.

MUCH comment is being caused by the description of the reconstruction of the Continental Trust building, in Baltimore, given in the various technical journals, and I am frequently asked, even by architects, "What is the use of building a fireproof building if, after a fire, it has to be entirely rebuilt excepting only the steel work and its encasement of tile, and the tile floors?" There is a certain pertinence to the question, and yet it is its own answer. The materials that were not burned or destroyed constitute the only really fireproof portion of the building. In nothing else did that building, or many others of its kind, differ from the non-fireproof. Years ago fireproofing tile was generally known as "fireproofing" and when it was introduced into the structural parts of a building that building became "fireproofed" and its structure *was* fireproof. The trouble is that the architects stopped there. Usually in that fireproofing and steel work an engineer or specialist was called in. His functions terminated there. The architect continued the work from there on and how well he did it can be judged by how much havoc fire has played in the tests to which those buildings have been subjected in recent conflagrations. Under normal conditions merely fireproofing the structure offers such a barrier to the progress of fire internally that but little damage can be done to even wooden decorations ere such incipient blaze can be extinguished. The average architect is impressed with that fact and has grown negligent in regard to the greater risk, the conflagration risk, the risk from without, because great fires are, after all, comparatively infrequent, and he is willing to take chances in the gamble that *his* building may not be in the center or vortex of that fire, should it occur. He goes sublimely on, therefore, packing in wood finish, all sorts of combustible materials in the decoration, and even in the exterior uses materials that he must know will be grievously damaged by even the most insignificant fire in a neighboring building, granite, stones, marbles, exposed metal, all such materials, because, forsooth, he has gotten into the habit of handling them and thinks they are pretty. Is the "fireproofer" or the "fireproofing" to blame for the negligence, the carelessness or ignorance of the average architect who does not finish his building consistently with the methods formulated by that fireproofer in regard to the purely structural parts? Is it not the rankest imbecility to ask an engineer or a manufacturer of fireproofing material to guarantee that everything ignorance may put into a building whose structure is protected will not burn? And yet, that *is* what the average man expects. If he sees tile going into the floors of a building, immediately inflammable doors, trim and, indeed, dry goods and other stores become immune to fire and achieve fireproofness through contact with that tile which will prevent them burning, even if you soak them well with coal oil!

Fire is much like any other trouble, civic upheavals for instance. It is well to have a good police force, a necessity, but there are troubles that have to be handled with troops, where police would be absolutely ineffective. So with your buildings; the police is your fireproof structure—and you can place absolute reliance upon it doing its duty at all times and under any circumstances—but don't exact it to do the duty of a whole army; don't expect it to render absolutely immune all the wood and tinder you can pile upon its floors. Be intelligent.

The pity of it is that people, even our best architects, become habitual offenders. Take in that Continental building in Baltimore, for instance. You would think that since nearly all of the building, save the fireproofing and steel, had to be done over again the people in control would have learned their lesson, and eliminated many of the features of the first building that contributed so much to its destruction. You would think that some of the wooden floors would be eliminated, that extra precautions would be taken with the partitions, et cetera, as in the case of the Barklay building. But no, we are told that the partitions will be built up seven feet high with terra cotta blocks "and continued to the ceiling with *woodwork and glazing*!" Will a fire outside or inside always be sure to strike at no higher than seven feet from the floor? If it should miss that exact psychological mark, will it not go through the woodwork and glazing into the next room? And if it does go through, will people not say, "Why, and those were fireproof partitions!" and then proceed to damn fireproof partitions as being useless?

If that Continental building were now surrounded by fireproof buildings, and the whole district be also of fireproof buildings—even in the accepted term—there would be some sense in rebuilding it exactly as it was before and the external risk would now be less than in the former case. But that is not so. Baltimore, I firmly believe, is in just as poor a condition as far as the danger from fire is concerned as it was before the fire. The general class of buildings is scarce one whit better than the old. Indeed, I am not prepared to say that there is not greater danger from a conflagration now than there was before that of February a year ago. Everyone expected to see Baltimore redivivus in splendid shape, a model city, but the people have rebuilt just as cheaply and as inflammably as the law would permit, and the law permits a good deal more latitude than it should, and even the few safeguards that are thrown about have been fought tooth and nail. O tempora, o mores!

* * *

The National Board of Fire Underwriters has issued some very interesting reports of late. These show that our fire losses have reached the stupendous sum of $3,600,000,000 since the year 1877. And to look at the figures you would think that it was the report of an export, for instance, something that is ever growing. In the old times when people had to build of wood, big fires might be reasonably expected. To-day when at least the structures can be absolutely fireproof, and with a little intelligence all else about a building can be rendered nearly so, you would imagine, particularly when you have realized how much has been spent upon fire departments and water supplies, that the fires would be lessening in their number, or at least in their destructiveness. But no, in the 70's the losses were in the sixty millions ($60,000,000) a year. In the 80's they had climbed up to the hundred millions ($100,000,000). In the 90's they were hovering around the hundred and fifty millions ($150,000,000). In the 1900's they began to exceed the one hundred and sixty million mark ($160,000,000) and in 1904 they struck the $230,000,000 gait. Shameful!

Incidentally the same record shows that since 1820 we have had about one conflagration every two years, a grand sweep that wipes off a whole section of a city, a sacrifice of hundreds or thousands of buildings.

* * *

It is pleasing to note that some of the colleges, engineering schools, and, in fact, correspondence schools have inaugurated courses in fireproof engineering. Heaven knows but that such training is needed.

Now, if the technical magazines that reach the architect will continue the good work begun by FIREPROOF MAGAZINE and lay before the average practitioner facts and figures in succinct terms that will impress him with the importance of the matter, a still greater step in advance will be taken. Meantime, the press generally throughout the country has given splendid assistance in the propaganda that has been inaugurated by the Buildings Inspectors' Society and other municipal bodies looking to the wide dissemination of useful information regarding sound buildings. There is scarcely a paper now that does not at some time or other make some comment on the desirability of more fireproof structures, or deplore the fact that there are but 3,000 buildings in the entire country that can lay any claim to that term, or otherwise exhort their readers to build better. The popular magazines are giving a helping hand. It's a splendid movement and everyone endowed with any intelligence and municipal pride, or even Christian charity, should join in and help to his utmost. The deplorable feature of it all is the apathy of the average architect; that of the people is excusable, while in the architect it is criminal. Mark you, I say the average one. He has gotten into the habit of showing joists on his sectional drawings of houses and buildings generally with nicely shaded cross-bridging between them, and unless his client specifically orders that a steel and tile structure be planned, that architect is going to show those confounded joists and cross-bridging, and if you say "fireproof" to him he will hold up his hands in holy horror, declaring that it costs so much that if he uses sound construction he will have to cut down on his stone front and his mahogany wainscoting! The average architect (and mark you again that I say average) thinks more of his pretty front that he does of the life and property of his client. Now that is a broad statement to make of a profession that includes but about five thousand members, but I contend that at least three thousand five hundred of them are average and at that statement I will stick. Disprove me if you can.

That the people generally are receptive enough, if information is only given them, is proven to me time and again every day. The average layman doesn't know enough to get up and clamor for that information, to take the initiative in the matter, but he *does* feel that there is something wrong about the generally accepted way of building, he craves something better and the moment you give him sensible advice, or even a hint, he settles down to it and is ready and anxious to listen to reason. Here is just one letter, brief and to the point, that voices the sentiments expressed in much longer terms by hundreds of other letters, and that simply goes to show that the average American reader is not lacking in intelligent perception of what is right and what is wrong, and that it isn't necessary to live in a great city in order to be alert and anxious to be up to date. This particular letter is from a man in a small interior town. It says:

"I read in the .... an interesting article by you on fireproof construction of domestic buildings. I would be greatly interested if you would send me some additional data, showing the relative cost of wood and terra cotta, and the proper method of construction of the latter. I feel that wooden architecture is passing, and that every effort to supplant it with some more durable material should be encouraged."

Now, could anything be more pathetic than that last sentence? The man sees wood burning up all around him, and he *feels* that that is not the way to build. The article he refers to was the merest epitome of the subject, really but a few words of exhortation to build better. And yet it opens a door to him, lets in daylight, and through him hundreds of others will be benefited.

I suppose that the editor will comment that he well knows the fact I am going to mention, and therefore am I wasting space in saying anything about it, but nevertheless and notwithstanding, from the first I have been thoroughly impressed with the excellence of FIREPROOF MAGAZINE, its matter, purpose, get-up, illustrations and all, but that excellence was more forcefully impressed upon me recently than ever before. As a rule I have but time to glance over each succeeding number, but here a day or so ago I had occasion to look up some data that I knew was somewhere in FIREPROOF MAGAZINE and that I had forgottên to have indexed. Well, I went over number after number until the desired item was found, but meanwhile I'd stop to read here and there and it was a revelation to me, in spite of my intimacy with the work, what a splendid handbook or text-book the whole thing made. Statistics of importance to architects, engineers, experts and laymen alike, treatises on construction, powerfully and clearly written, educational in the extreme, data such as the comparative tests by the National Testing Station anent work that had never been done before, of immense value to every practitioner, editorials that bristle with good points and direct the way in no uncertain terms to the solution of most of our problems in buildings, and the cleverest articles by experts upon subjects seldom, if ever, touched elsewhere, yet of the most vital interest. Take, for instance, the article by Mr. Walsh in the August number upon architects and fire underwriters. The subject has not been fully appreciated by even the best practitioners. To most men engaged in building and at all in touch with insurance matters it has seemed that insurance requirements have not progressed with the times. This article makes clear the whole situation and really merits being reprinted and far more widely circulated than is even FIREPROOF MAGAZINE. But then the same thing applies to so many other articles. Indeed, a file of the little book ought to be kept right on the architect's desk, ready at hand for quick reference. It would do him good, and there are mighty few of us who would not be greatly benefited by freely dipping into its pages.

[We take the dose and make no comment.—ED.]

UNIFORM STATE BUILDING LAWS NEEDED

From the *American Architect.*

The disadvantages of lack of co-ordination in legal requirements that are in one direction impressed on automobilists nowadays through the variation of local speed limits, and in another are brought home to those hindered in securing a divorce through variation between the statutes of the several states, have, in still another quarter, attracted the attention of the New Jersey Chapter of the American Institute of Architects to the difficulties and annoyances to which architects and builders are subjected through the needless variations of the building requirements of different cities throughout the state. The chapter, feeling not only that the building community is needlessly harrassed by these quite unnecessary variations, but that much private loss to owners and some public danger accompany the present condition of things, has formulated a resolution calling on the various municipalities of the state to appoint commissions to discuss and adopt a general code of building regulations that shall have application to all the towns in the state. New Jersey is a compact little state and has an unusual number of towns of approximately the same size, the consequence being that builders operating in several adjacent towns are very likely to forget that what is permissible in X— is altogether forbidden in Y—, whereas actual conditions are such that the same building code could fairly be made to apply to both. The New Jersey chapter in seeking to promote the formulation of a general law has rendered just the sort of service to the public that such an organization should undertake to render.

OUR NEW YORK LETTER

FOR FIREPROOF PIERS, DOCKS AND SHEDS

New York, August 7, 1905.

AT the time of writing this a fire has just swept the water front on the New Jersey side of the Hudson River, destroying several docks, piers and storage sheds before the fire department could extinguish the flames, causing damage to the extent of about $750,000, and further losses through the interruption of all business on the river front.* The conflagration is but a repetition of periodical fires on the water front of New York and New Jersey, where shipping interests are the heaviest, and where storage houses on the end of the docks and piers are invariably full of the most valuable articles known to commerce. It is a notorious fact among firemen here that a water front fire is the most difficult to control and the quickest to spread, and at different times the fire department has criticised the city for permitting the storage of inflammable goods in the tinder-like sheds that cover most of the docks and piers.

Recently an official appraisement of the pier system and water front property of New York placed the total value, including the New Chelsea improvement, at $150,000,000. This value has been based upon the annual rental of the piers and docks owned by the city. Recent improvements have added some 1,799 linear feet to the city's wharfage, increasing its pier capacity some 70,000 square feet. There are over 88 miles of water front measured around the piers and docks, and much of this is the most valuable land in the world. The city has attempted at various times to make certain improvements in its docks and piers, but usually these are restricted to filling in and construction, iron or wooden piers with more or less serviceable sheds on the end.

In view of the recent survey and appraisement of this valuable water front property, the question of protecting it from fires has been called up, and merchants with stores along the line of the piers have strongly petitioned the dock department to make some efforts to prevent future conflagrations, which have time and again swept along the river fronts. Owing to the relatively high rentals of the docks on the New York water front, a number of the large steamship companies have crossed the river to the Jersey shore for docking privileges. Thus the North German Lloyd Company are building their mammoth docks and sheds at Hoboken and the Hamburg-America line is likewise developing their piers in the same place. Other large transatlantic steamship companies have docking facilities on the Jersey shore which they are developing and improving along the line of modern demands. On the New York side the local steamship companies and private dock organizations are contemplating some extensive changes that will completely revolutionize conditions in this section.

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*Since setting up this letter we have received information from our correspondent that the Delaware & Lackawanna Railroad Company, which sustained this loss, has already made plans to spend $2,000,000 in repairing their terminal, and the new buildings will be absolutely fireproof. The houses and piers will be of steel, concrete and fireproof tiles, according to the present plans of the engineer.—Ed.

A word or two about the fire hazard on the city's water front. The insurance companies consider the sheds, warehouses and storage rooms on the docks the most hazardous risks that they can write and rates are in many cases exorbitantly large. A good many companies refuse to insure goods stored in their sheds on the docks, and private companies take the risks when they leave goods on the piers over night. It is said by experts that upward of $100,000,000 worth of goods are temporarily stored on the docks and piers of Manhattan nearly every night in the week, and that when a sweeping fire destroys the property the losses to individuals are enormous. Owing to the very high rates of insurance the merchants find it unprofitable to insure their goods, and trust to chance that they can be removed before any fire breaks out.

When a water front conflagration does start it spreads, as a rule, for many blocks before it can be brought under control, and no attempt is made to save the piers or sheds. All the efforts of the fire department are directed toward preventing the spread of the fire to adjoining docks and property. The highly inflammable nature of the goods and piers and sheds render effective fire service impossible, and the struggle is a slow and primitive fight against the fire.

The wonder of it is that so few attempts have been made in the past to construct fireproof piers and sheds so that ordinarily small fires could never get such headway. The Maritime Exchange has repeatedly sought to interest the city and steamship companies in the question of building docks and piers that would prove absolutely fireproof. Several years ago a circular was issued to the merchants and steamship companies by a committee from the Maritime Exchange recommending the construction of fireproof docks and sheds in the future. It was contended in this circular that a single pier built of iron piles, protected by concrete, with all sheds and storage warehouses made of fireproof bricks, tiles and porous terra cotta, would stop the spread of a water front fire more effectively than half a dozen costly fireboats. Such a dock would offer a barrier to the conflagration which it would be difficult for the fire to cross, and at the same time it would save goods stored in the sheds to the extent of hundreds of thousands of dollars. The saving on insurance rates alone would prove an important item.

Apparently no attention was paid to this warning, or at least no definite results were obtained. Shortly afterward came the disastrous fire at the docks of the North German Lloyd Steamship Company, and later the New York Central's docks and piers at Fifty-ninth street were swept out of existence, and the oil works at Bayonne on the Jersey and Staten Island side. The losses in these individual cases amounted to huge sums, and the exceedingly vulnerable nature of the docks and piers began to be fully appreciated. Several of the steamship companies proceeded to build their docks and sheds of different material and with a more or less enlightened understanding of the fireproof problem.

It is not too much to say that a new era in the construction and improvement of the piers and docks is dawning, and the few isolated examples of first-class work must inevitably have beneficial effects. At the present time New York's pier front is about as primitive and antiquated as that of any small port of a half-civilized country. More than half of the piers are wooden affairs, built of wooden piles driven in the mud of the river and covered with thick wooden planks. Some of these have wooden sheds and warehouses constructed on the end or extending the full length. Others, with an absurd attempt at protection from fire, have warehouses constructed of steel framework and covered with sheet or corrugated iron. These latter are called by some "fireproof" sheds, but some recent fires along the water front have opened the eyes of those who have stored goods in such places. Even if built on fireproof docks such warehouses would prove only a little better than wooden sheds. If a small fire started on an adjoining dock the iron warehouses would go up in the general fire.

The present movement has been started to reorganize the dock system and to build for permanency and not for short duration. A good many of the railroad and steamship companies stand ready to construct fireproof sheds and warehouses if the docks and piers are built according to modern fireproof plans. But it would prove futile and wasteful to construct fireproof sheds on wooden docks. As an illustration of this, the New Jersey Central Railroad recently had plans drawn up for extensive improvements of their docking facilities for the line of summer boats running to the seashore resorts, but it was found impossible to obtain properly built piers where fireproof warehouses would be safe, and the plans had to be altered so that their new dock has been covered with an iron framework and sheet iron.

In the first place, the dock department of the city is at fault. Controlled chiefly by politicians, little attempt has been made to develop the docks and piers according to modern engineering science. The excuse has always been made that it was easy enough to rent the docks and piers and it was foolish to spend money in making them fireproof. But there has come about a change in opinion lately. A number of fireproof docks and piers have been constructed, and the annual rental of these has proved to be so far in excess of the returns for the unimproved docks that the investment has been very profitable. But the city is slow, very slow, in bringing the dock system up to date. The Chelsea improvement work will add some $25,000,000 of dock valuation to the city, and the work accomplished in this line is but an indication of what is needed and what may soon be accomplished.

The iron and concrete piers and docks represent the highest perfection of constructive work in the city's development. With the iron and steel foundation completely protected by concrete from corrosion or action of fire, the piers exhibit a substantial permanency that should make them as lasting as the modern buildings that have been built in the city. The foundations of these model docks and piers go down in the mud to foundation rock, and they are as solid as they can be made for all heavy work. They possess, furthermore, immunity from fires, that makes them peculiarly fitted for a water front that has no superior in valuation in the world. A fire starting on one of these iron and concrete buildings would have little chance to spread or to do more damage than consume the inflammable materials stored there.

With the piers once built properly, the question of erecting sheds and storage houses on them appropriate to the needs of the various railroad and steamship companies is of even more vital importance. In this respect some of the absurdities of modern contract work are apparent. Half the advantages of solid concrete piers are nullified by covering the top with wooden floors and erecting over them sheds of a makeshift character. Iron and steel framework unprotected by tiles or bricks, and the whole covered with sheet iron plates, represents to a large extent the degree of advance made by the dock department in constructing fireproof warehouses on the water front. These warehouses are filled with miscellaneous merchandise of a very inflammable nature, and a fire once started in the goods would not only warp, twist and destroy the iron work, but the flames would leap out and spread to adjoining piers. To make such warehouses as safe as possible, the very highest engineering talent in fireproof construction and the most up-to-date materials are demanded. The very best is none too good for this work. Indeed, the structures would be subjected to a fire test exceeding that usually imposed upon the ordinary office building. Few of the latter are stored at any time with such combustible material as is the average dock warehouse or shed.

When we consider that steamers valued from half a million to two or three million dollars each are often warped alongside of the piers, so that in case of a fire they are very apt to be damaged, if not totally destroyed, it is quite apparent that the fireproof construction of pier foundations, sheds and all other parts should be absolutely first class. One such pier jutting several hundred feet into the river would prove a barrier to the spread of a water front fire that would demonstrate better than anything else the need of fireproof docks and warehouses.

Some of the steamship companies have entered into plans for the improvement of their docks and piers, which shows their appreciation of the value and need of fireproof warehouses. One of the best illustrations of this is the new pier buildings of the Hamburg-American line at Hoboken, photographs of which were recently published in the FIREPROOF MAGAZINE.* Little or no wood is used in this building enterprise. The piers are of concrete and iron, and are permanently constructed to carry the heavy load above and to last for centuries. The foundation is consistent with the sheds and warehouses on top.

The buildings are constructed of iron girders and columns encased in porous terra cotta, and the partitions are built of 8-inch tile, and the roofs of flat hollow tile arches. Every part of the iron work is completely protected from fire by porous terra cotta or tile. The sheds and warehouses are thus absolutely fireproof, and the floor of the pier being of solid concrete offers little material for a fire to spread.

An important feature of this pier construction is that it is divided into sections or compartments, with fireproof walls or partitions separating them. The ordinary pier has a building extending the full length, with no attempt made to divide it into compartments, and goods stored in any part can ignite from a fire started on the end. There is consequently no possible way of localizing a conflagration that has once started in the warehouse. Such a fireproof pier and shed might be rendered so hot from a huge fire composed of thousands of bales of cotton, barrels of tar or pitch, and general merchandise, that the damage might to be quite considerable. There is only one way to make a pier shed practically safe against fire, and that is to divide it into fireproof compartments like the interior of a ship.

This is what the Hamburg-American Steamship Company has sought to do in their new pier at Hoboken. Numerous partitions separate different sections of the pier from the others. There is a storage room for general freight, a room for inflammable articles, waiting rooms for passengers, and storage rooms for detained baggage. Each section is divided by fireproof partitions of 8-inch tiles. In the event of a fire it would be possible to protect a large part of the pier and sheds and any great conflagration would thus be prevented from spreading. In the completion of the fireproof equipment the pier and sheds will represent a radical but most efficient departure from past methods of constructing temporary storage houses on the ends of docks.

The new piers and dock sheds of the North German Lloyd line at Hoboken are constructed of steel, brick and concrete, and they have sought to make a decided advance upon the old methods. They have been built with a view of avoiding another such fire as swept the Hoboken docks of this company five years ago, and the engineers have planned to use as little combustible material as possible in the sheds and warehouses. The iron framework is exceptionally heavy, designed to carry the heaviest possible floor loads. But, as the FIREPROOF MAGAZINE pointed out some time ago, some fatal errors have been made in the construction of the buildings which leave the iron work improperly protected from a fire.* This of itself lessens the safety of the sheds and warehouses to such an extent that a repetition of the last disastrous fire might follow should a great mass of combustible merchandise stored on the pier ignite.

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*See FIREPROOF MAGAZINE, Vol. VI, p. 181, April, 1905.

The building of new fireproof piers, sheds, warehouses and temporary storage compartments for baggage and merchandise by the great steamship and railroad companies on the water front of a great city like New York thus represents one of the most important developments of modern times. Millions of dollars' worth of property could be annually saved to the shipping interests if all docks and pier sheds were thus constructed, and from present indications it is merely a matter of years before the movement toward accomplishing this end will become quite general. At present our docks and pier sheds and stores are about a decade behind time.

GEORGE E. WALSH.

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*See FIREPROOF MAGAZINE, Vol. VI, p. 146, March, 1905.

BENALLACK ON THE ELECTRICAL FIRE HAZARD

EXTRACTS FROM A PAPER READ BEFORE THE WESTERN SOCIETY OF ENGINEERS AT CHICAGO, MARCH 10, 1905

BY WILLIAM T. BENALLACK.

I AM at present connected with the Western Factory Insurance Association, which is an organization of stock companies insuring manufacturing plants, equipped with automatic sprinklers, and each risk is inspected quarterly by an expert in fire protection engineering. Such inspection that I now make is confined to factories, but for ten years I was electrical inspector with the Michigan Inspection Bureau and inspected all classes of electrical work in 157 towns, finding all kinds of conditions—good, bad and indifferent. Until a first inspection is made I rarely find equipments being installed in accordance with the Code Standard, and, if I judge by past experience, very little standard work would be secured unless we visited these various towns, inspected the wiring and constantly urged the necessity of correcting the existing defects in the old work and complying with the rules in new construction. As a rule, very little difficulty is experienced in securing the co-operation of the more important electric light companies and contractors, who are just as anxious as we are that the work shall be properly done.

There is a prevailing impression that the poor electrical man is responsible for all the electrical fires, when, in reality, a great many of the defects are really due to the property owner, who insists on cheapness, and frequently when I have run across an equipment that was below the required standard I have found that he has insisted on using cheap and inferior material against the advice of the electrician. At the same time, some electrical contractors invite this condition, for I have known many cases where the purchaser receives a proposition for a certain piece of work, and in accordance with the usual custom complains the price is too high. The contractor then attempts to defend his proposal by stating that he has figured on doing the work in accordance with the Code Standard, which costs more, and that it can be done in a cheaper manner. He is then asked if it will work all right—replies that it will—and later if the work is criticised by an inspector the argument is used that he would not pay the price for good work. In large office buildings and factories I find that the janitor or engineer is supposed to make all ordinary repairs and additions to the electric lighting system, and often with dire results. I do not wish it to be construed that there are any objections to their doing electrical work, providing they are familiar with what constitutes safe and proper wiring, and I believe they should be sufficiently posted so that in case of emergency they could make any ordinary repairs to lights or motors, but results, so far from this source, are not very encouraging and furnish a thorn in the side of the reputable electrician who is endeavoring to do good work at a fair price.

The following are some of the prevailing defects found to exist and have demonstrated the electrical fire hazard: Wooden switchboards, rheostats, cut-outs, switches and supports; no main cut-outs or switches located at the point where service enters the building; main switches installed so as not to be protected by the main cut-out; switches and cut-outs installed in close proximity to curtains and other inflammable material; scattering of inferior types of cut-outs over the building, and frequently too many lights on circuits; insufficient supports and wires on walls not protected from mechanical injury; conductors of too small capacity for the apparatus, and frequently of inferior insulation; the indiscriminate use of cord pendants of unnecessary lengths in contact with metal pipes and hung on nails; cord used in show windows and on ceilings and walls instead of approved wire; splices and connections not soldered, sometimes poorly insulated and frequently bare; open type of arc lamps not provided with spark arresters; the use of trolley current for the operation of light or motors; last, but not least, poor mechanical construction.

* * *

Electricity has been quite a popular origin to attribute fires to, and many important fires have been written up as having been "caused" or "might have been" due to the "deadly wires," and upon investigation I have in many cases not found anything to indicate electrical origin. A great many electrical men justly resent this inference, but I am sure it has done them no harm and has been the means of emphasizing the importance of proper work. At the same time, I believe, the estimate of loss from this source is conservative and only includes such cases that can reasonably be charged to electricity.

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The National Electric Code is necessarily somewhat technical and has grown to such an extent that with the exception of electricians and wiremen it is to quite an extent too intricate for a great many who either do not have the time or ability to master its contents, and I believe that a few of the common but important rules in a condensed form would be appreciated. With this thought in mind some time ago I compiled the following in an address that I delivered before an underwriters' organization composed of special agents who could not hope to devote the time necessary to become familiar with the complete code. These few rules were not intended to cover large installations, but could be used to good advantage in a large majority of equipments:

"Service wires must, where they enter buildings, be supported on brackets and insulators and have a drip loop on the wires to prevent moisture from entering the tubes.

"Flexible tubing should be used on wires at front of buildings as a protection from contact with awning frames.

"An approved cut-out (fuse) should be provided on service directly inside of the building. Care should be taken to bring service in at a point suitable for safe and convenient location of cut-out.

"An approved main switch should be provided as near as possible to where service enters and be within easy reach of floor, so arranged that the entire equipment, including meter, can be disconnected when necessary. This switch should be protected by the main fuses.

"A separate branch cut-out should be provided for each 660 watts, i. e., the equivalent of 11 or 12 sixteen candlepower lamps, or one arc lamp. All cut-outs should be of the plug or enclosed cartridge type. It is always good practice to have cut-outs assembled in groups, depending somewhat on the nature of the building, and placed in approved cabinets lined with slate, marble or one-eighth inch asbestos.

"For ordinary open work, wires should be mounted on porcelain cleats or knobs which keep the wires at least one-half inch from the surface wired over and 2½ inches apart. Supports to be used at least every 4½ feet.

"Suitable mechanical protection should be provided on all wires running on side walls, either by a substantial boxing, wooden molding, or, preferably, metal conduit.

"Flexible cord must not be run on walls or ceilings in place of wire and is not approved in show windows. Cord is only designed for use as a pendant and should not hang lower than a distance of five feet from floor. Flexible cord drops of unnecessary lengths should be avoided as much as possible and be kept clear of contact with wood, pipes, etc. Where portable lights are required, cord especially designed for this use can be procured."

In all wiring, special attention should be paid to the mechanical execution of the work. I would rather see a lot of poor material well put up than the very best of approved devices installed in a careless, slipshod manner. In all of my experience I do not know of an electric fire having occurred where the equipment was installed in strict accoradnce with the National Code Standard, and I have known of good-sized installations that have been in operation for years without blowing a fuse.

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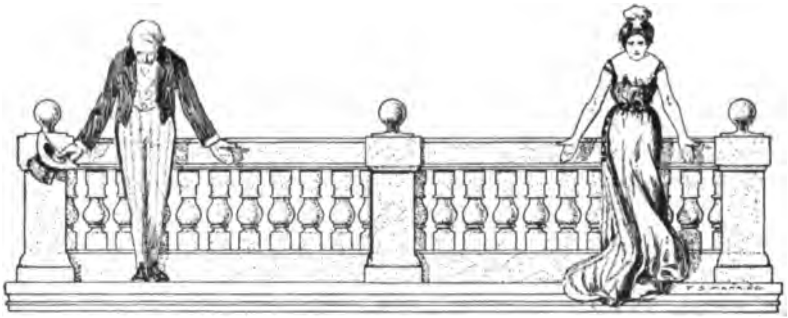
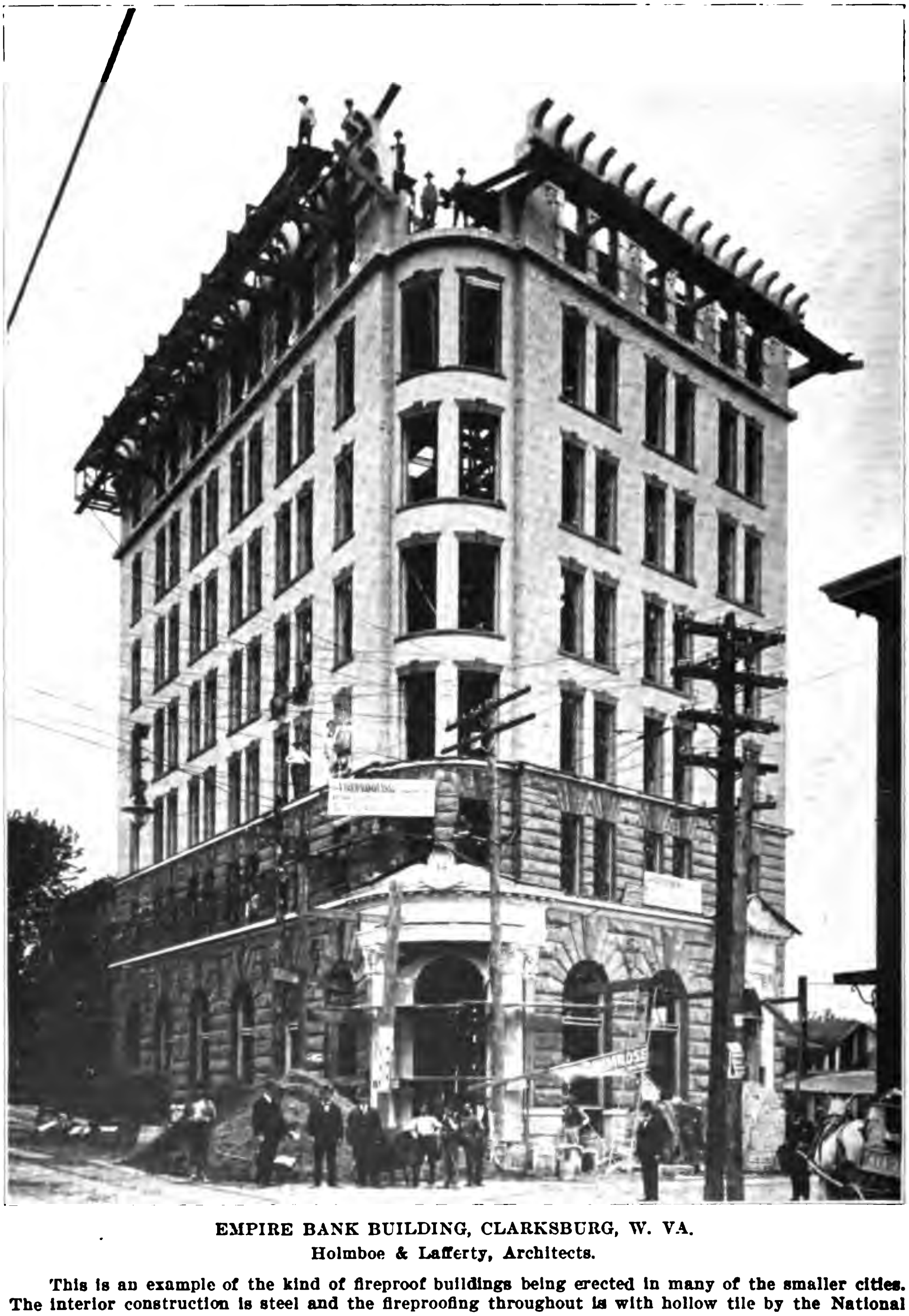
Metal conduits are to quite an extent taking the place of knob and tube work, and in New York and Chicago this class of work is required by the municipal departments for all concealed wiring. This rigid requirement has not been adopted by the National Code, and I would hardly favor it at this time, for while it is necessary and we require conduit work in fireproof construction and certain kinds of large buildings, it would be inflicting quite a hardship on the wage-earner's modest little $2,000 dwelling, many of which are being wired from day to day. I think it well, however, to recommend conduit in all cases where the property owner wants the best that can be had and is willing to pay for it.

The disaster in the Iroquois Theater, the worst of its kind ever experienced in this country, has tended to emphasize the importance of extra precautions necessary in the electrical equipment of theaters, not that the general character of the wiring itself was in any way responsible, but as a fire hazard, the electrical equipment of a theater is of the most vital importance. I have inspected about sixty theaters, and with the exception of a few of the more recently constructed, and those located in the larger cities, not over 10 per cent would pass inspection, and I venture to say if all the theaters in the country were inspected very few of them would be found in strict accordance with the requirements. Aside from the original equipment, the house electrician is supposed at a moment's notice to rig up any sort of temporary lighting contrivance that may be called for by the traveling companies, who also carry a great deal in the way of electrical effects, which, after a few months' severe service on the road resembles a lot of junk and presents a serious element of hazard. It is a very good plan for the local inspection departments to inspect this class of work as soon as the company arrives and endeavor to have such portions of the wiring and devices not safe corrected, using reasonable judgment so as not to inflict unnecessary hardships on account of the limited time at hand.





EMPIRE BANK BUILDING, CLARKSBURG, W. VA.
Holmboe & Lafferty, Architects.

This is an example of the kind of fireproof buildings being erected in many of the smaller cities. The interior construction is steel and the fireproofing throughout is with hollow tile by the National Fireproofing Company, using the Johnson system of floor construction. The exterior is brick and stone. the picture showing the cornice brackets, just placed in position. The general contractors are Elliott and Winchell of Clarkshurg.

FOR SAFETY

FIREPROOF MAGAZINE

DEVOTED TO METHODS OF SAVING LIFE AND PROPERTY

INTERESTING AND VALUABLE TO EVERY ARCHITECT AND INVESTOR IN BUILDINGS

VIEW IN RUINS OF CHICAGO, 1871.
Washington Street, Looking East.

FIRE LOSSES ARE A TAX UPON THE NATION: A TAX THAT CAN BE LARGELY REDUCED

FIREPROOF PUBLISHING COMPAN
CHICAGO

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Vol. 7

OCTOBER, 1905

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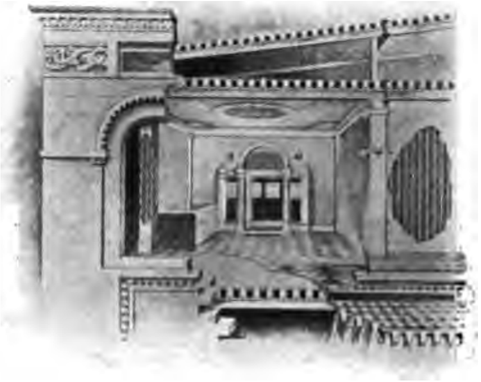

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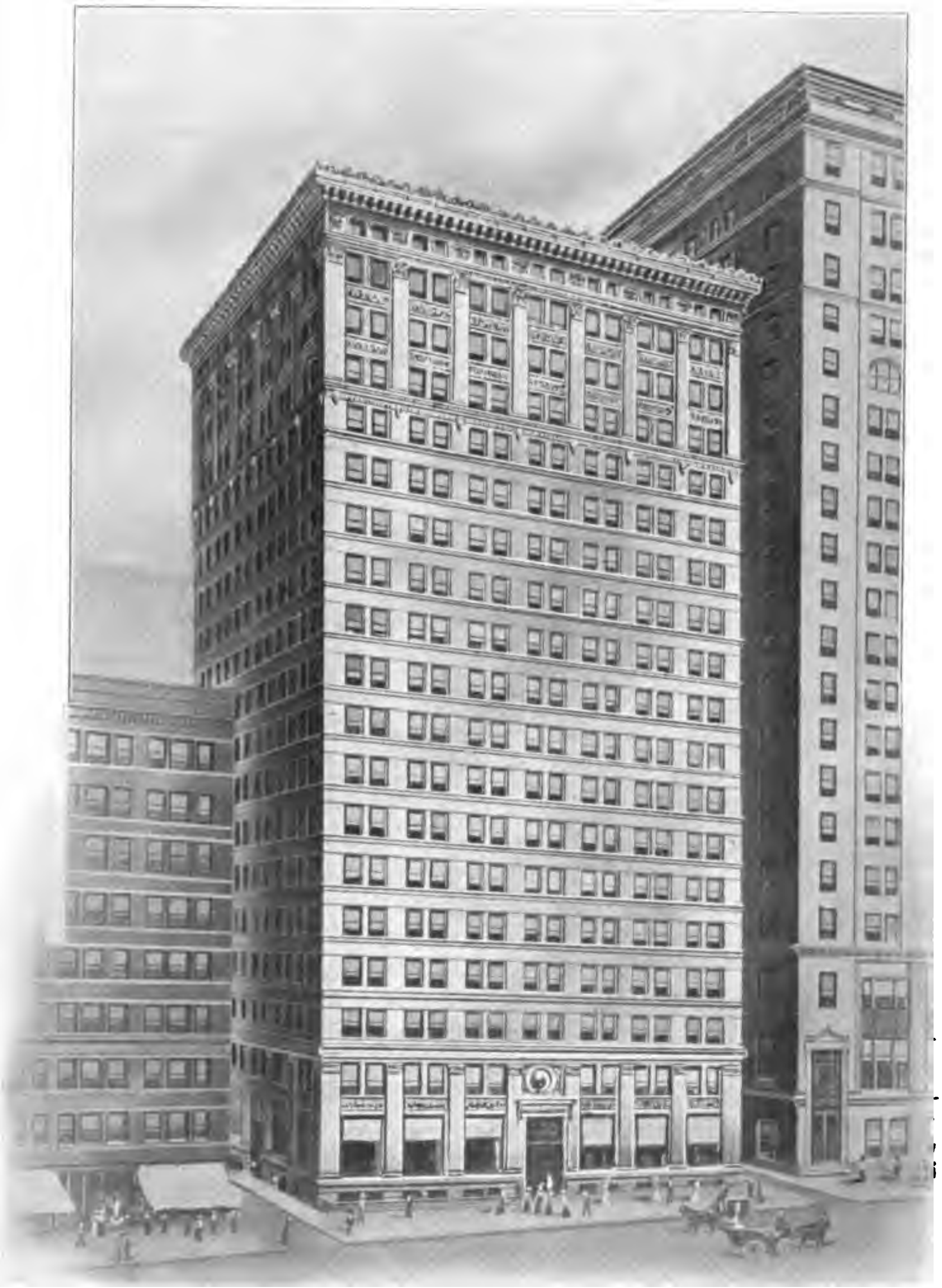
FIREPROOF MAGAZINE
Great Northern Building, Chicago

The Editor of FIREPROOF MAGAZINE takes this occasion to express his obligation to the several Architects, Engineers, Contractors and other experts who have contributed to these pages and helped to make a standard book of reference for all who are interested in stopping the astounding losses of life and property in buildings by the adoption of rational methods for preventing fires and conflagrations. But it may not be generally known that these columns are open to all who can contribute valuable information to that end. Excellent fireproof buildings may be erected without our knowledge in such a large country as this; and we are always desirous to receive photographs, plans and descriptions of them. If accepted we will pay the regular space rates, not only for written matter, but for the space occupied by illustrations that may be used. Address the Editor.



THE FRICK BUILDING ANNEX, PITTSBURG.
D. H. Burnham & Co., Architects. From the Architects' Perspective Drawing.

FIREPROOF MAGAZINE

Vol. 7. October, 1905 No. 4

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Great Northern Building, Chicago

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THE BRICKBUILDER FIREPROOF HOUSE COMPETITION

ON other pages of this issue will be found reproductions of the first, second and third prize designs in the *Brickbuilder* Fireproof House Competition. When the conditions of this competition were printed in the *Brickbuilder* for December, 1904, we called attention to them editorially, with the hope to give more extended publicity to this praiseworthy effort to elicit from the architects of this country the best solutions of the fireproof house problem. The prizes offered were generous—$500, $200 and $100—and for the amount of actual work called for were more munificent than those ever before offered by any journal for designs intended only to demonstrate *an idea* and not for actual use by a client. They were to be given to the public solely for educational purposes. The scheme was especially interesting at the time for two reasons: first, because it called for a demonstration of the value of hollow machine-made burned clay tiles as a building material as well as a fireproofing material; and second, because the advertisement appeared simultaneously with our description and illustration of the Henry houses at Pittsburg, which are an actual demonstration of the practicability of erecting fireproof houses of moderate cost that are paying investments.

Nothing that has ever appeared in FIREPROOF MAGAZINE has attracted so much attention as the story of the Henry houses. It has appeared in dozens of newspapers and is still coming back to us in our exchanges and press clippings. There is nothing new, as stated by us in their description, in the erection of fireproof residences of the more expensive kind, which has been going on for thirty years past. But the fireproof house of moderate cost is now in demand. The first attempt at building fireproof buildings of moderate cost was made by the late Prince Consort Albert of England on one of his own estates. They were built for workingmen, but the example he set was not followed by others. These plain and unpretending residences in Pittsburg are the first of the kind ever built in this country, *as an investment,* and they have proved to be a paying investment. The *Brickbuilder* competition called for designs for detached houses, such as persons who are able to invest $10,000 can build in city or country, from architects' designs, for their own use. The prize designs speak for themselves and the observations in the report of the jury of award are worthy of careful perusal. This report shows that only the first prize design can be executed within the cost price fixed in the conditions, which, we think, is correctly stated. Those competitors who have succeeded so well are entitled to all the publicity their plans have obtained, and more detailed information about the methods of construction contemplated can doubtless be obtained from them by correspondence. Ben Cortland Flournoy can be addressed care of the Supervising Architect, Treasury Department, Washington, D. C.; Henry Brooks Price, care of Hunt & Hunt, Architects, New York City, and Joseph W. Wilson, care of Nimmons & Fellows, Marquette Building, Chicago. Very curiously, while this competition was open to all architects, the three prizes went to young men who are in the employment of others. It shows that we must look for the solution of valuable problems of the day to the future rather than the present architects.

SEEKING OUTSIDE INSURANCE

IN an editorial note following an article that appeared in FIREPROOF MAGAZINE for August (page 57) we said: "One matter to which we have heretofore called the public's attention is, that in some states there is not enough available insurance 'to go around.' That is, that some large establishments which look to fire insurance for their main protection cannot get enough policies to cover their prospective losses. This is beginning to be appreciated more and more every day, and it is so important that it has been made the subject of the leading article in *Insurance Engineering* for July." The following is part of the article referred to, which is well worth reprinting. It is followed by a long list of "common defects in existing buildings," and is backed up by an official list of the great number of individuals and firms "seeking outside insurance," for whom affidavits were filed in the New York insurance department in 1904. There are seven hundred names in the latter list. But we cannot spare room for these addenda to the article.

WHY THOUSANDS OF INDIVIDUALS AND FIRMS EXPERIENCE DIFFICULTY IN OBTAINING INSURANCE—A NEW YORK STATE LIST—ONLY ABOUT 60 PER CENT OF LOSSES COVERED BY INSURANCE.

"Two facts stand out boldly in the history of fire losses in this country: (1) On an average probably more than 35 per cent of the losses are not covered by insurance. (2) Every year thousands of individuals and firms are unable to obtain within the state where their properties are located all the insurance they require against loss by fire. The result is an abnormal waste of capital—a waste that is not distributed over the entire country, as losses that are covered by insurance are but a waste that falls heavily on firms and individuals.

"Could two stronger arguments be given in favor of better construction of buildings, better protection against the spread of fire from one building to another and better facilities for fighting fires? Is it cheaper to "take a chance," or would it not be a profitable investment to put more money into the construction and protection of a building? Loss of business may and does frequently follow a fire.

"It is true that the situation is relieved slightly in some states by laws allowing an individual or firm to procure additional insurance from companies not authorized to do business therein upon filing an affidavit stating 'that the party desiring insurance is, after diligent effort, unable to procure the amount required to protect the property owned or controlled by him from the insurance corporations duly authorized to transact business in this state' But the embarrassment still exists.

"'Seeking outside insurance' has a very real meaning to every man who has been refused insurance on his store, or his warehouse, or his mill—in fact, the question of protection from loss by fire, whether it be an insurance policy or, what is better, a fireproof building, is a vital one to all commercial interests.

"Why do so many merchants and manufacturers and owners of buildings as well experience difficulty in insuring their properties? Is there a limit to the available supply of indemnity? Or are these particular properties not acceptable as objects of insurance? Both of these questions may be answered in the affirmative.

"From the last statement it might be inferred that there are two ways of remedying the matter: (1) By increasing the supply of indemnity through the investment of more capital in the insurance business. (2) By improving the character of buildings as objects of insurance. From the economical point of view there is but one remedy, the second one mentioned, for it should be the constant endeavor of the public at large to *reduce* the annual fire loss."

PHILADELPHIA'S REBUILT OBSERVATORY TO BE A FIRETRAP

IN Mr. Bertolett's account of the burning of the Boys' Central High School at Philadelphia in FIREPROOF MAGAZINE for April, the following were among his closing sentences:

"The lessons to be gleaned from the burned observatory tower and roof story are not new; they have been impressed at high cost many times before, but we are slow to profit by them and it will be interesting to note what the effect will be upon those having the rebuilding work in charge. Will they be again reconciled, out of consideration for a portion of the roof still remaining, to rebuild with wood, lath, plaster and stamped sheet metal, or will they take warning and be prompted by what has been accomplished by the sturdy clay tile floor systems which have so triumphantly withstood the fierce onslaught of flames and floods, with nothing more serious than superficial scars?"

The total want of appreciation of their duty to the people of Philadelphia on the part of the Sinking Fund Commissioners and the Property Committee of the Board of Education, no less than of the reminder in the above quotation, was shown by their action on the fifth of September. The Sinking Fund Commissioners refused to appropriate more than $24,000 for the restoration of the tower and astronomical observatory of the Central High School. Then the property committee proceeded to consider bids for the work. The lowest bid received was for $24,000, and the additional charge for fireproofing was only $1,497. *For this paltry saving the contract was awarded without fireproofing.* But it was not done without protest. Some of the members of the committee said it would be an outrage, but one member said Mayor Weaver would veto the decision. The discussion, however, was due rather to a wrangle over the merits of certain contractors than to a consideration of the advantage of protecting the valuable instruments of the observatory from fire. Perhaps Mayor Weaver may add to his other good deeds some consideration of this question to which Philadelphia legislators are indifferent.

EDWIN P. OVERMIRE

EDWIN P. OVERMIRE of Minneapolis, one of the best-known architects in the Northwest, died recently at his home in that city at the age of forty-one. He had been ill about two months and had only lately returned from a sanatorium in northern Wisconsin, where he had hoped to find health. In the immediate family there remain a wife, two daughters and a son. Edwin P. Overmire was born in Mattoon, Ill., and went to Minneapolis twenty-three years ago with his parents. He attended the Minneapolis grade and high schools.

In 1891 Mr. Overmire returned to Minneapolis. His first connection was with the firm of Overmire & Orth, and then he opened an office for himself. The latest work of Mr. Overmire was the C. M. Pond building, under construction on First avenue south. He was well known for the residences and churches he had designed. The last church was a $50,000 structure in Siam. Mr. Overmire was a student and voluminous writer for trade and architectural journals. He was also secretary and treasurer of the Minnesota Chapter of the American Institute of Architects. He was ambitious to make the chapter of value to the local architects, and worked hard to further its interests and usefulness. He had a great interest in the practical problems of building and has written much on the value of fireproof construction for the early numbers of FIREPROOF MAGAZINE and other periodicals. As architect for the new Methodist Hospital at Minneapolis, which is a thoroughly fireproof building, he was one of the first to introduce the Johnson long span system of reinforced hollow tile floor construction.

THE LAST ABOUT "FIREPROOF" WOOD

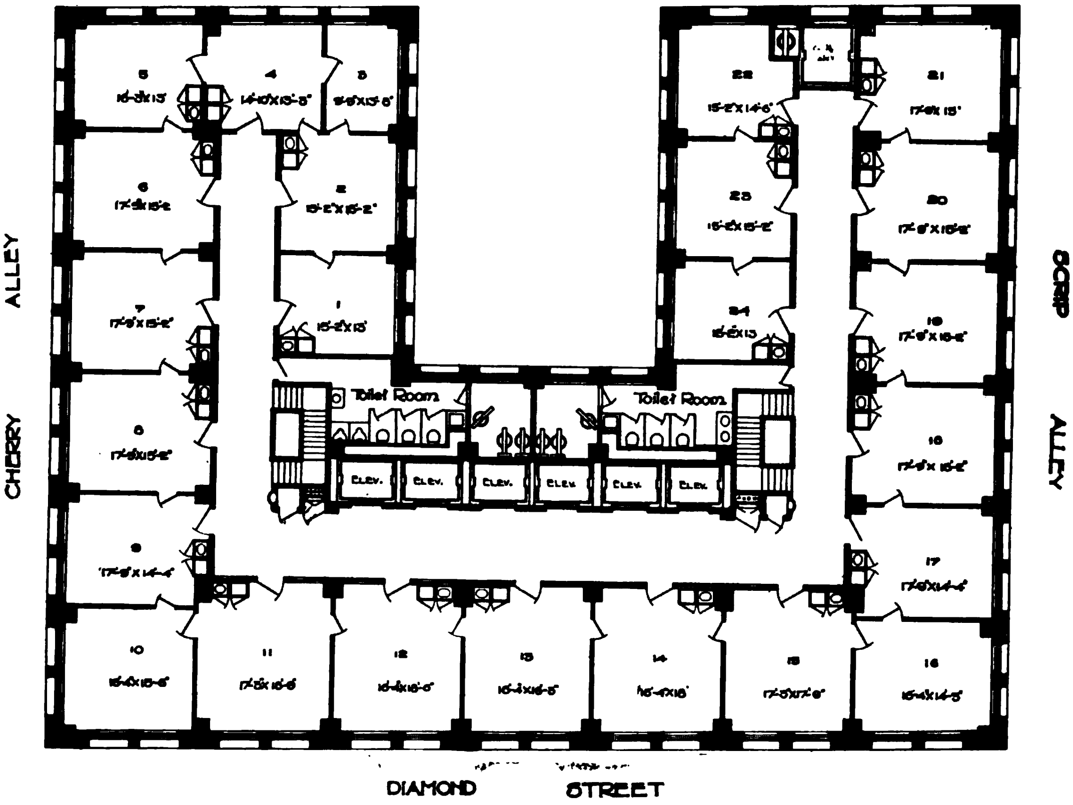
WE have just received REPORT NO. XVIII from the Insurance Engineering Experiment Station at Boston, dated August, 1905, entitled "Second Report on Fireproof or Non-Inflammable Wood." The first report had demonstrated very clearly how little value is to be found in treated lumber, and the second shows that it is now only a little better. Mr. Atkinson says of this last test that *"All the examples were destroyed in a comparatively short period of time and the wood is in no sense fireproof."* And he gives it as his opinion that there is no possible ground on which the use of this prepared wood should be made compulsory by city ordinances or legislation. Professor Norton's conclusion is that it has slight value as a fire retardant. There are more ways than one of testing this material, as will be seen by the following from the *American Lumberman:*

> "Some of the large woodworking establishments have hesitated to figure on trim, where the specifications called for certain fireproof process wood to be used—first, because it is harder to work, and second, because there was no way to dispose of the refuse, which with wood which is not fireproofed is used to burn in the furnace to make steam. They, however, were tempted to try a large order as an experiment and found their first objection could be overcome; but when it came to disposing of the refuse by a very singular oversight when they started working the fireproof wood they forgot to remove their blowers, which fed directly into the furnace, and when they finally discovered that they were feeding fireproof shavings directly into their furnaces they were amazed to learn that the shavings were urning all right and that the boiler was making steam in the same old way, and afterward they found that by the sprinkling of a little soft coal that fireproof shavings were excellent fuel. Now, one of the largest buildings in the country is finished with the trim that these shavings came off and it went in as fireproof trim."

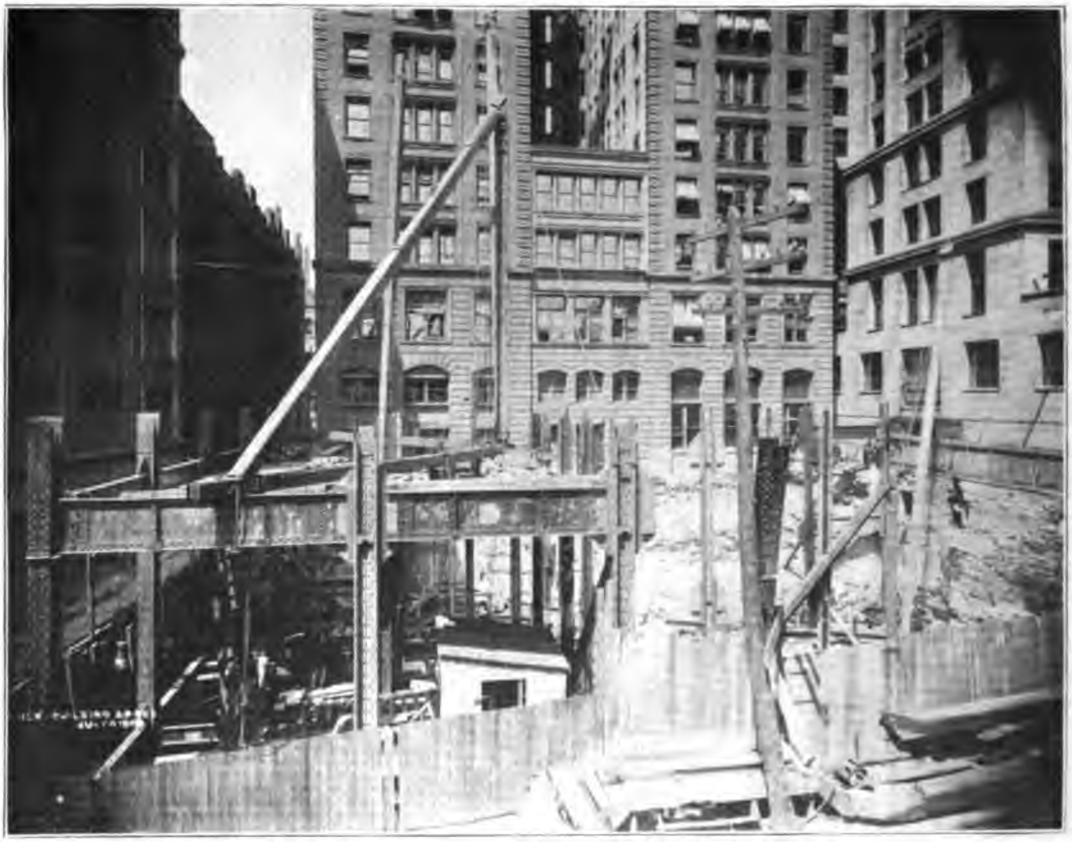
THE FRICK BUILDING ANNEX, PITTSBURG

BY W. I. PARRY.

TO everyone at all familiar with the rapidly changing "sky line" of Pittsburg, the present Frick building has doubtless been an object of special interest and great admiration. Its commanding position at the summit of Grant Hill where Colonel Grant met his defeat in the French and Indian War of old colonial days, locally denominated as "The Hump," directly opposite that last masterpiece of the great architect, Richardson, the Allegheny County Courthouse, independent of its own magnificent proportions, makes it an object that can hardly be unnoticed by any visitor to the Iron and Steel City. In addition to these features which are certain to attract attention, it is an imposing structure of severe but dignified style, with its granite walls and heavy Doric columns or pilasters, its roomy interior, wide corridors, entries and numerous open spaces. In fact, its whole interior design is free from any attempt whatever to skimp or economize floor space, but, instead, it is evident that the ever-



FRICK BUILDING ANNEX.
Typical Plan of Office Floors.

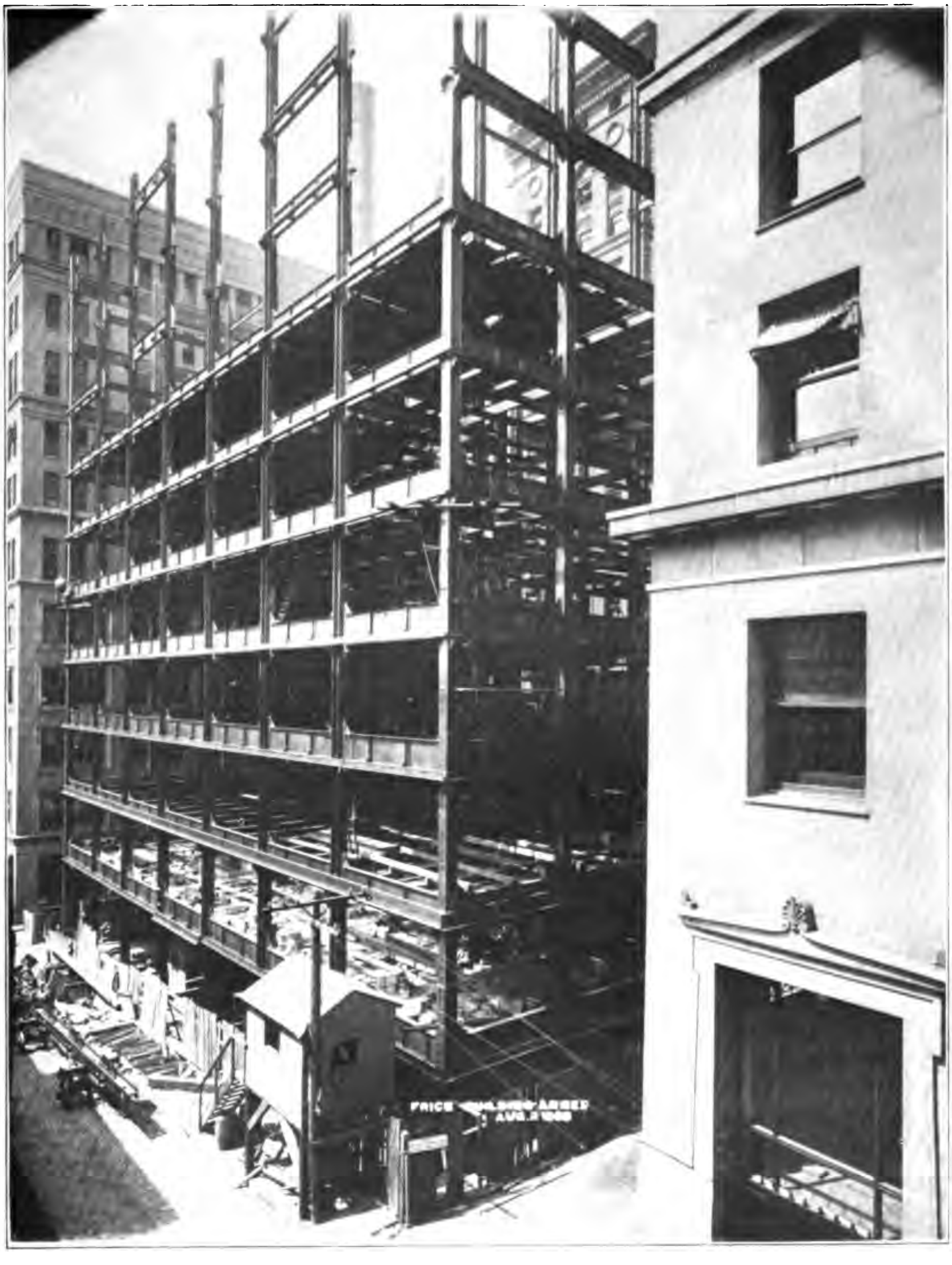


FRICK BUILDING ANNEX.
Steel Skeleton on July 3, 1905.

present idea was to emphasize the broad lines on which it was designed and developed, and the result is a building not easily overlooked or forgotten and one with few if any superiors of its kind.

The popularity of the original Frick building as office quarters for the larger corporations and leading professional men is attested by the new Annex building now in course of erection, which will adjoin it on the west and which, although smaller both in area and height, is still a structure which will be classed among the large buildings of this country. Its front on Diamond street, which is shown in the cut of the building, is 120 feet 2 inches, while its sides on Cherry and Scrip alleys measure 92 feet 1½ inches. It extends from Diamond street along these two alleys to Relief alley, which separates it from the Carnegie office building, so that, as will be observed, it is surrounded by thoroughfares on all four sides. It will have nineteen stories above the upper level of the hillside on which the building stands, and two cellar floors below. The cut accompanying this article is taken from the architect's drawing and shows on the right a part of the end of the Frick building, the structure on the left being a portion of the Kaufmann department store. (See frontispiece.)

The accompanying floor plan shows the general arrangement of rooms, elevators, stairways and corridors. It will be noticed that a light well 30 feet wide cuts into the building in the rear, producing the popular U-shape of office building. This light well is placed directly opposite a similar light well of the same width in



FRICK BUILDING ANNEX.
Steel Skeleton on August 2, 1905.

the Carnegie building, which has the effect of a large light opening or area, broken by the alley which separates the two buildings.

The two halftones accompanying this article show the steel work at an interval of a month, one being July 3 and the other August 2. These will give a very fair idea of the rapidity of erection, the longest delay so far being due to excavation which, owing to the nature of the ground, was done almost entirely by blasting. This building, like the Frick and Carnegie buildings, is literally "founded upon a rock." From the illustrations a general idea of the steel construction may be obtained. The first picture, taken when the building was in its early stages, shows behind the Annex a very good view of the rear of the Carnegie building. The method of splicing the columns and their large wing plates or gussets, to which the spandrel girders are riveted, are brought out with particular clearness. The second photograph shows the general scheme of the construction throughout, the chief idea of which is its extreme simplicity and thoroughness.

The wind bracing of the building is based entirely upon its system of deep wall girders at every floor level into which the floor beams frame, completely enveloping all sides of the building, including its light well. Added to this is the fact that, though all the floor beams run in the same direction, that is, from front to rear, yet on the sides of the building where the beams of the floor system naturally parallel the wall girders, additional beams are introduced as headers at about the same interval as the spaces throughout the building, from five to six feet. These headers are framed into the girders and the nearest line of floor beams, thus making a series of struts entirely around the building which, when filled with the arches, makes a truss with a bracing effect against any lateral stress at every floor level of the entire construction.

The columns are of the plate and angle type throughout, a style which is coming more and more into favor with structural engineers as their experience in building design and erection widens and presents, in this instance particularly, the greatest ease in securing good work both in shop and field erection. The prevailing sizes of floor beams are 9 and 10 inch with 15-inch interior girder beams. Sixteen-inch terra cotta arches are used almost entirely throughout the building, all of the end construction type, the span of the arches being generally the same, between 5 and 6 feet in width.

It will be noticed that the depth of this arch exceeds the depth of the deepest floor beam by six inches. This enables a complete enclosing of the floor beam top and bottom, thoroughly fireproofing the metal and making all ceilings flush, the interior girder not showing in the ceiling below, and also diminishes the concrete filling usually required. This construction makes the floor stronger and lighter on account of the absence of this filling and is in accordance with the newest ideas on the subject of fireproofing. Another advantageous method of construction which is being used, and one worthy of encouragement, is the enclosing of the wall columns with brick, leaving an open space around the column, into which concrete is grouted, completely surrounding it.

This general description will give an idea of the simplicity and consistency of the entire design. The building is entirely free from cantilevers and attempts at wind bracing in strange and inconvenient places and of extremely doubtful utility. There is nothing complex or theoretical in the design. Good shop work of the simplest character and ample strength prevails, with full consideration of the purposes of the construction. The result of this rational treatment is a building which typifies the superior work of the practical structural engineers of to-day.

The architects of this building are D. H. Burnham & Co. of Chicago, who also designed the original Frick building, the steel construction—which, by the way, is similar to that of the Frick building—being designed by their chief engineer, Mr. J. G. Giavor. There will be required in its erection about 2,800 tons of structural steel, the majority of which will consist of built-up columns and girders, all of which material is being rolled and fabricated by the Carnegie Steel Company. The terra cotta arches, which are noticeable for their uniformity in size and character, are furnished by the National Fireproofing Company. The general contractors for the building are Wm. Miller & Sons of Pittsburg, the entire work being under the direct supervision of the chief engineer of the Frick building, Mr. D. B. Kinch.

PROFESSOR WOOLSON'S TEST OF LIGNOLITH

EARLY in the present year Professor Ira H. Woolson of Columbia University made a report to the superintendent of buildings of New York City on an interesting test made by him of the fire-resisting qualities of "Lignolith," a material manufactured by the Hecla Iron Works, Brooklyn, N. Y. Lignolith is a composition, the component parts of which are not revealed, which can be used in making doors, window frames and sashes, and it is claimed that it can be used for other purposes.

The test was made on an enclosure furnished with these doors and windows, and it is a peculiarity of this material that it is not reinforced with metallic members, but it is homogeneous throughout and can be fabricated in such small dimensions that it can be made into sash bars. The windows used in the test had upper and lower sashes, each with four lights of wired glass. Hence it was equally a test of Lignolith and wire glass. In fact, the success of the test depended largely upon the glass holding its place against both fire and water.

The test house was 9 by 14 feet in dimension and 9 feet 6 inches from the grate floor to the ceiling. The long sides of the house were used for the test, the ends being permanent constructions. On one side were two double hung windows, and on the other a door made in a single slab two inches thick, without reinforcement, and hung from a track by trolleys. The partitions in which the door and windows were set were monolithic and made of Lignolith two inches thick, and they also were subject to the same test. The fire test lasted a few minutes more than an hour. Within the compartment was an iron columns covered with Lignolith and a closet with sliding door made of the same and in which were placed various delicate articles. But the main interest was in the door and windows.

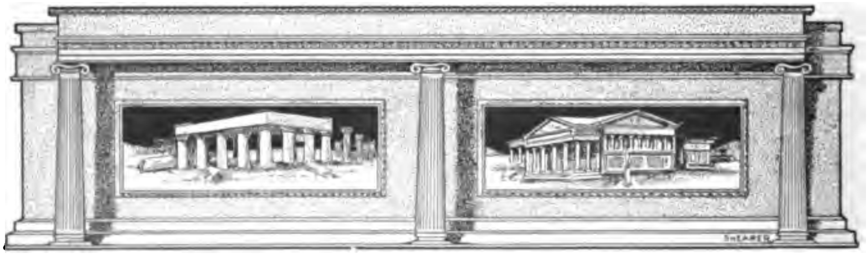
A temperature of 1,700 degrees F. was attained in half an hour and maintained until water was thrown into the house from a fire hose, as usual in such cases.

The effect of the heat was to crack the glass at once, and it continued to crack, but retained its position during the test. The sashes warped inward about one and a half inches. The application of water caused the sashes to recover partly, and when cool warped only one inch. The inner part of the rails, stiles and muntins was washed away, but the outside held its place, so that after the test the sashes could be raised and lowered. The radiation of heat through the windows was intense. The inside surface of the window frames was washed off about one-quarter of an inch.

The effect of fire on the inside of the door was such that twenty minutes after starting it the door warped inward three-quarters of an inch. This was greatest at the top, caused by the warping of the trolley track. In forty-three minutes the top of the door warped away two inches from the partition, evidently for want of sufficient fastenings for the trolley track, and the flames wrapped both sides of it. "This," says the report, "served to burn the top part of the door upon both sides and charred it entirely through on one side. When the water struck it a large piece was broken out of the edge which was most exposed, and a diagonal break extended to the top." A thermometer placed against the outside of the door showed a temperature of 194 degrees fifty minutes after the fire was started.

The effect of water on the interior of the door and partition work was to wash off from one-quarter to one-half inch of the surface. The interior of the closet and the things placed in it were intact after the test. The sashes, though of the most delicate construction, seem to have endured the best test, and the result showed that they were a practical fire-stop. Remarks by the expert refer to the stifling odor of chlorine gas that was emitted during the test when moisture was being driven out of the material by the heat, and he gives as a cause for this that "fresh mortar mixture moistened with the chloride was liberally used in finishing the building up to an hour or so before starting the test."

It looks as if this may prove to be another addition to the incombustible materials for displacing wood from the finish of fireproof buildings. It would appear that it could be made more useful by steel wire reinforcement through the center where it would not increase the warping, and that metallic protection for the edges of the door must be necessary.



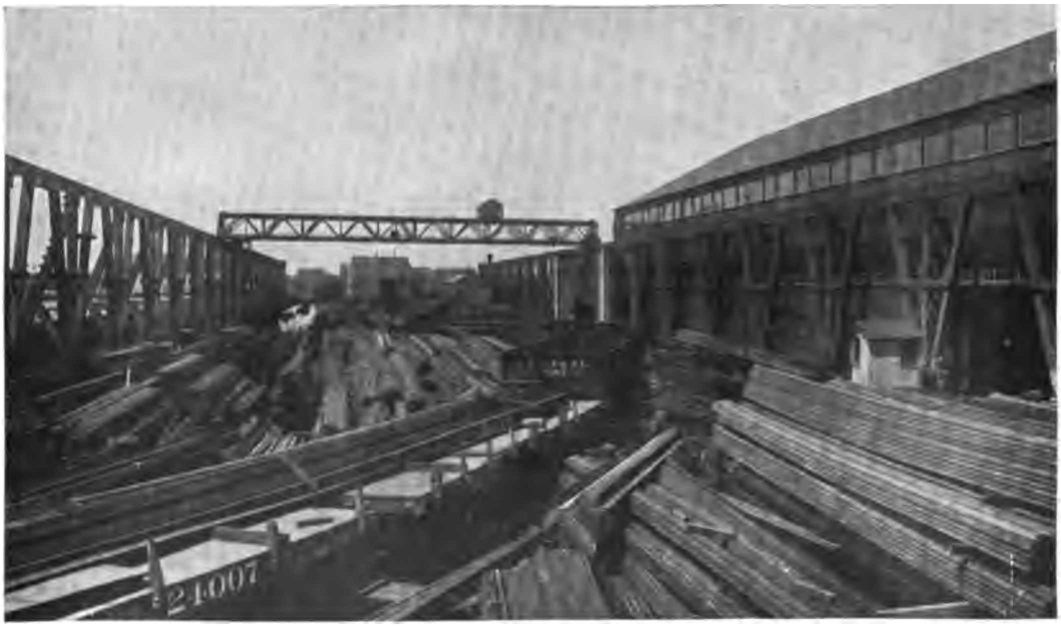
THE NEW WAREHOUSES OF JOSEPH T. RYERSON & SON AT CHICAGO

THE spirit and energy of the western merchant to do what others have not done, and to carry stock which others could not, long ago put Chicago to the front as a great distributing point for iron and steel. The pioneer firm in this branch of industry has been Joseph T. Ryerson & Son, which was founded in Chicago by J. T. Ryerson in 1842.

This idea, namely, to carry a stock which at all times would be equal to the demands made upon it, and to be able to ship from it immediately upon receipt of order material cut to length, punched, coped, etc., to fit the buyer's requirements, has resulted in this firm having to-day the best equipped warehouses and most complete stock in America.

The new Sixteenth street plant for the storage and fabrication of structural material covers a space bounded on the east by the tracks of the Pennsylvania and C., B. & Q. railroads, and on the west by Rockwell street, on the north by Fifteenth street and extending south nearly to Seventeenth street. The warehouses are entirely of steel construction and are devoted to the storage of structural shapes, plates, sheets, bars, bands, hoops and machinery.

Bars and plates occupy the north warehouses; all sizes and all shapes from the lightest to the heaviest rolled are carried

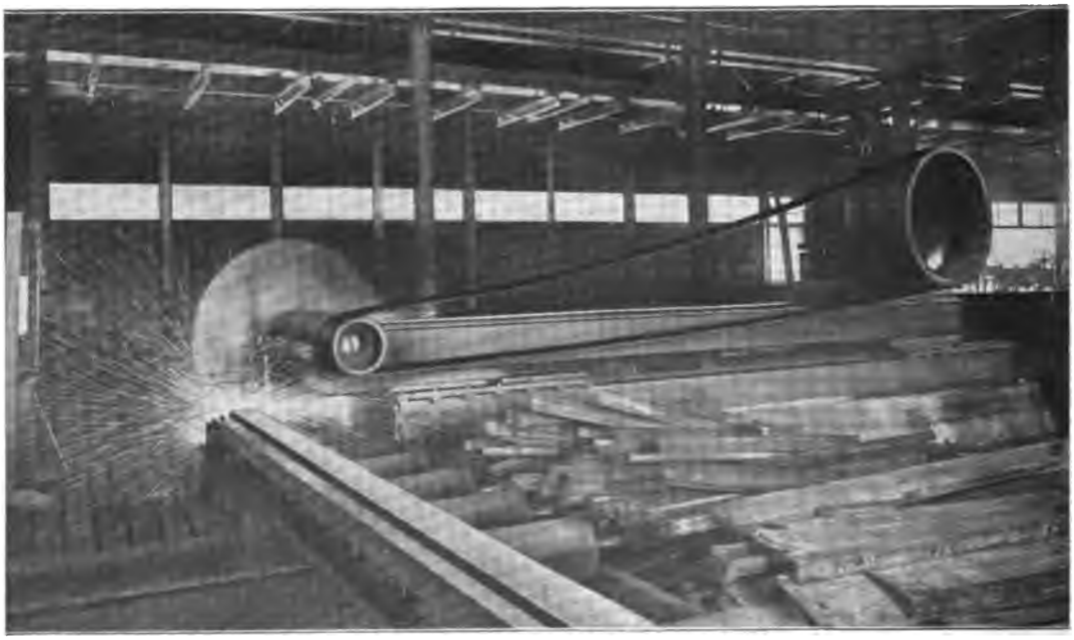


THE UNLOADING YARD—SHOWING STRUCTURAL WAREHOUSE ON THE RIGHT.
SIXTEENTH STREET PLANT, JOSEPH T. RYERSON & SON.

in stock and arranged in accordance with size. Trolley cranes have access to every portion of the floors, so that any material can be quickly carried to the cars, wagons, or to the various machinery for cutting to length, punching, coping, etc., without a second handling. This stock of plates embraces over 572 sizes and represents, as has been said, the largest stock in the world.

The east end of this warehouse abuts on the Pennsylvania Railroad and is bounded by a switch, enclosed within the walls, which runs the entire length of the building. Above the switch track there are two 30-foot cranes of ten tons capacity each. There are also facilities for loading seven cars on a sidetrack just east of this warehouse. Occupying a central position on the lower floor of this building is installed the largest guillotine shear yet built. It stands 22 feet high, weighs 222,000 pounds and is operated by a 50-horsepower three-phase Westinghouse motor, direct connected. The flywheel weighs 7,000 pounds and revolves at the rate of 18 per minute and the tool has a capacity of shearing 12 feet of 1½-inch material at one stroke or punching 150 holes ½ inch diameter through the same stock.

The south warehouse proper is 240 feet deep and 190 feet wide and is used for the store of structural shapes. As in the other buildings, the various material is arranged and classified according to size. Four cranes cover every part of the floor and there is a spur from the Pennsylvania Railroad tracks extending inside and the whole



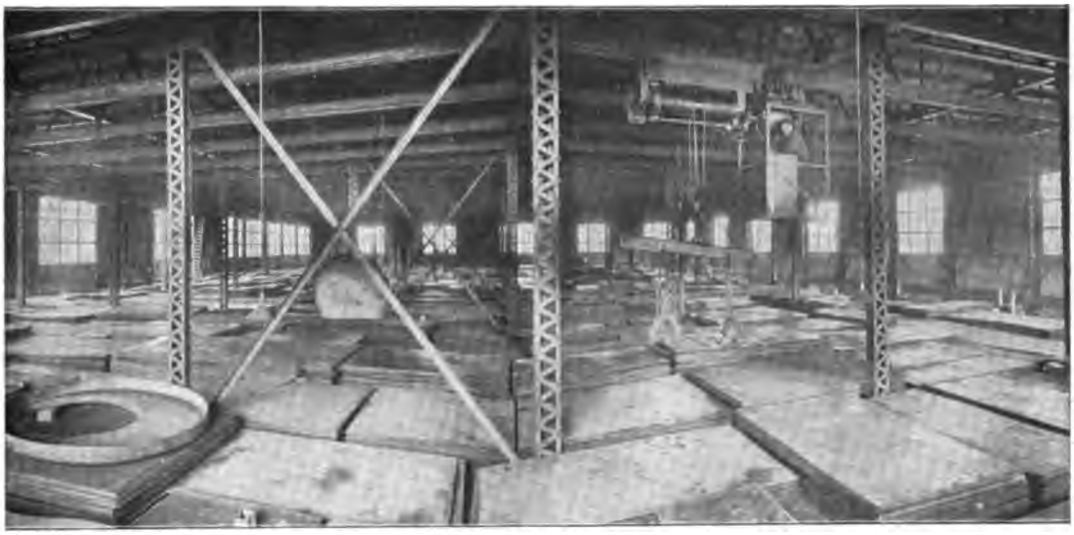
THE LARGE FRICTION SAW FOR CUTTING STRUCTURAL SHAPES TO LENGTHS.
SIXTEENTH STREET PLANT, JOSEPH T. RYERSON & SON.

width of the building at right angles to the crane travel. Loading platforms extend along the north side of this building, so that wagons may be loaded directly by the cranes or by the supplementary equipment of hoists, etc. The stock of structural material carried includes not only the commonly used sizes, but those for which there is seldom call, the one idea being to have every section for which there is a demand in modern construction work. The housing of all the lighter weights of structural shapes insures the purchaser material free from scale and rust.

One of the most interesting pieces of machinery in this shop is the new 52-inch friction saw. This machine was specially designed for Joseph T. Ryerson & Son for the rapid and economic cutting of structural steel. The saw disc is 52 inches diameter; it is made of flange steel ⅜ inch thick and has a peripheral or cutting speed of 27,037 feet per minute. It is connected by a 16-inch 3-ply belt to a 100-horsepower, 220-volt, 580 revolutions per minute alternating current motor. The drive pulley is 48 inches in diameter and the shaft pulley is 14 inches, giving it a speed of 1,988 revolutions per minute.

Material is carried to this machine from the yard and structural warehouse on power driven rollers and the same arrangement is used to carry the material away. Some idea of the rapidity with which this machine cuts steel can be gleaned from the fact that it passes through a 15-inch by 42-pound I-beam in 9 seconds and through a 24-inch by 100-pound beam—the largest size rolled—in 16 seconds.

During the recent congested condition of the mills the stock carried in this plant has been the means of preventing a cessation



THE MAIN PLATE FLOOR, SIXTEENTH STREET PLANT, JOSEPH T. RYERSON & SON.

of building and manufacturing operations in all parts of the country, and has been the one source of supply that could be depended upon to furnish at once any size, any shape and any weight. To have what an order calls for and deliver it to a customer when he wants it and before he expects it, describes this enterprise in few words.

ON SECTION OF THE BAR FLOOR, SIXTEENTH STREET PLANT, JOSEPH T. RYERSON & SON.

THE RITZ HOTEL, LONDON

BY J. C. C. HOLDING.

THE Ritz Hotel, London, is just being completed. Its chief interest, so far as readers of FIREPROOF MAGAZINE are concerned, lies in the fact that it is the first large contract taken by an English company organized to use American methods in building.

The contracting firm is the Waring-White Building Company, Ltd., which is an English organization, Mr. Waring, from whom the name is partly derived, being the owner of a large department store in London. A licensed architect of the state of Illinois, however, Mr. Reuben A. Denell, who was formerly with D. H. Burnham & Co. of Chicago, is in the employ of this company and his influence insures the continuance of American methods of construction, so successfully inaugurated in the execution of this first large contract.

The architects are Messrs. Mewes and Davis and John P. Bishop of 25 Dover

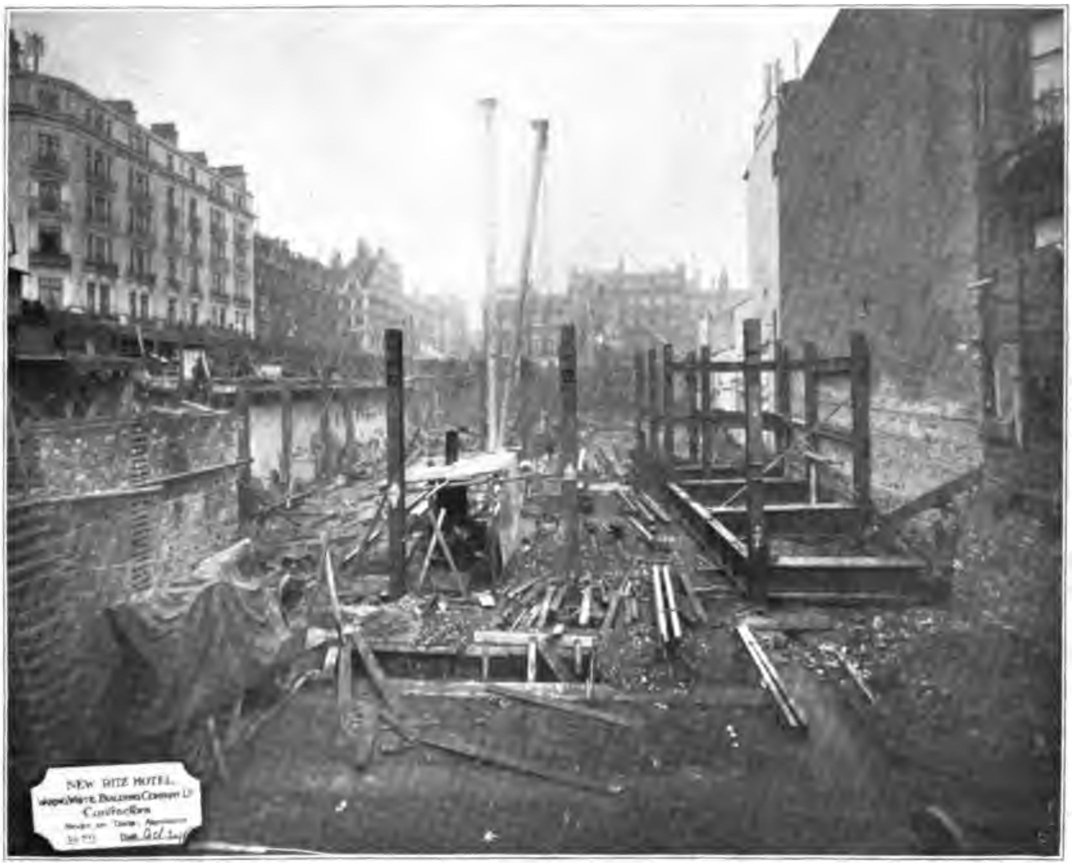


FIG. 1. NEW RITZ HOTEL, LONDON.
From Photograph Taken October 24, 1904. Showing Cantilever Foundation Girders.

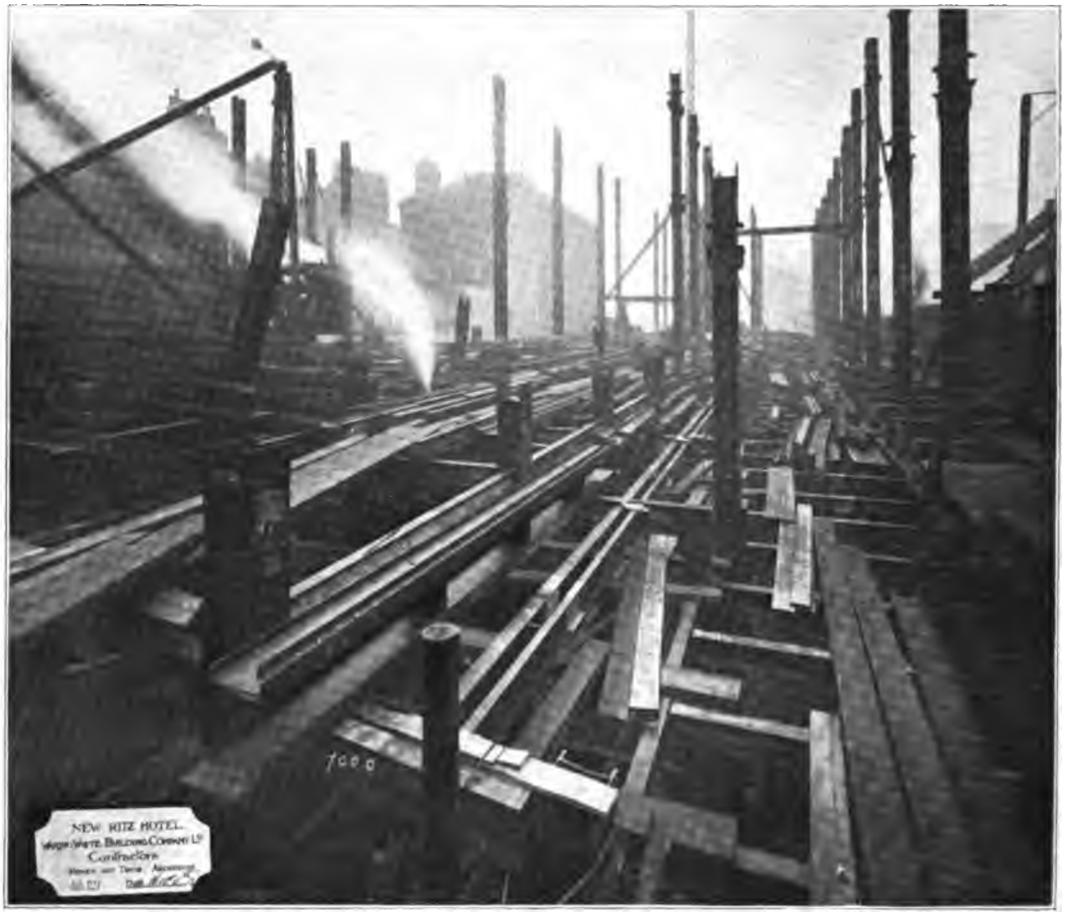


FIG. 2. NEW RITZ HOTEL, LONDON.
From Photograph Taken November 11, 1904. Second Tier of Columns Partially Erected.

street, London, W., and the consulting engineers are M. A. Potts & Co., also of London.

The hotel is located at the corner of Piccadilly and Arlington street, having its main frontage in Piccadilly and occupying the site between Green Park and Arlington street. Its length along Piccadilly is 231 feet 4½ inches, its depth along Arlington street is 115 feet 2¼ inches and along Green Park 87 feet 1⅛ inches. The area of the ground floor is about 22,000 square feet and the building is eight stories high above the basement. It is a modern steel frame structure and the construction practically conforms to the latest standards for steel frame office buildings in America. The steel was manufactured and fabricated by German mills. All the partitions are of hollow tile of American manufacture.

The walls are in accordance with the London Building Act, being 39 inches thick at the street level and 14 inches at the seventh floor level. They are of brick faced with granite up to the second floor and with stone above that point.

Basement floor level is 22 feet 7½ inches below ground floor, and the piers on which the columns rest stand in pockets excavated in clay to a depth of about 5 feet 6 inches, thus making the total depth of excavation for the foundations about 28 feet.

The concrete footings are 18 inches thick and upon these rest the steel grillages which average about 12 feet square and which are composed of two tiers of I-beams with cast-iron separators. The spaces between the beams in both tiers are filled solidly with concrete.

The writer understands that in figuring the sizes of the footings the calculations were based upon the dead loads somewhat after the manner described by Mr. W. I. Parry in the May number of this Magazine, thereby insuring uniform settlement.

An interesting feature of the foundation work is the manner of supporting the wall columns adjacent to Lord Winborne's house. In order to keep the grillages inside the building line and to prevent undermining the adjoining property, these columns had to be supported on cantilever girders, the heaviest of which weighs approximately 11 tons. There are nine of these girders averaging 3 feet deep, each composed of three web plates 6-inch by 6-inch flange angles and a number of cover plates 2 feet 6 inches wide. Some of them are shown in position in the photograph taken Oct. 24, 1904, which is here reproduced. This picture also shows the generous depth of the excavation for the foundations.

All of the columns rest upon cast-iron bases about 3 feet square with top and bottom plates and vertical ribs. The bases were carefully leveled on top of the grillages by the use of iron wedges, and after having been enclosed by clay dams the space of about three-fourths of an inch between the base and the grillage beams was filled in with cement grouting through holes in the cast-iron bases.

The columns are of the closed channel

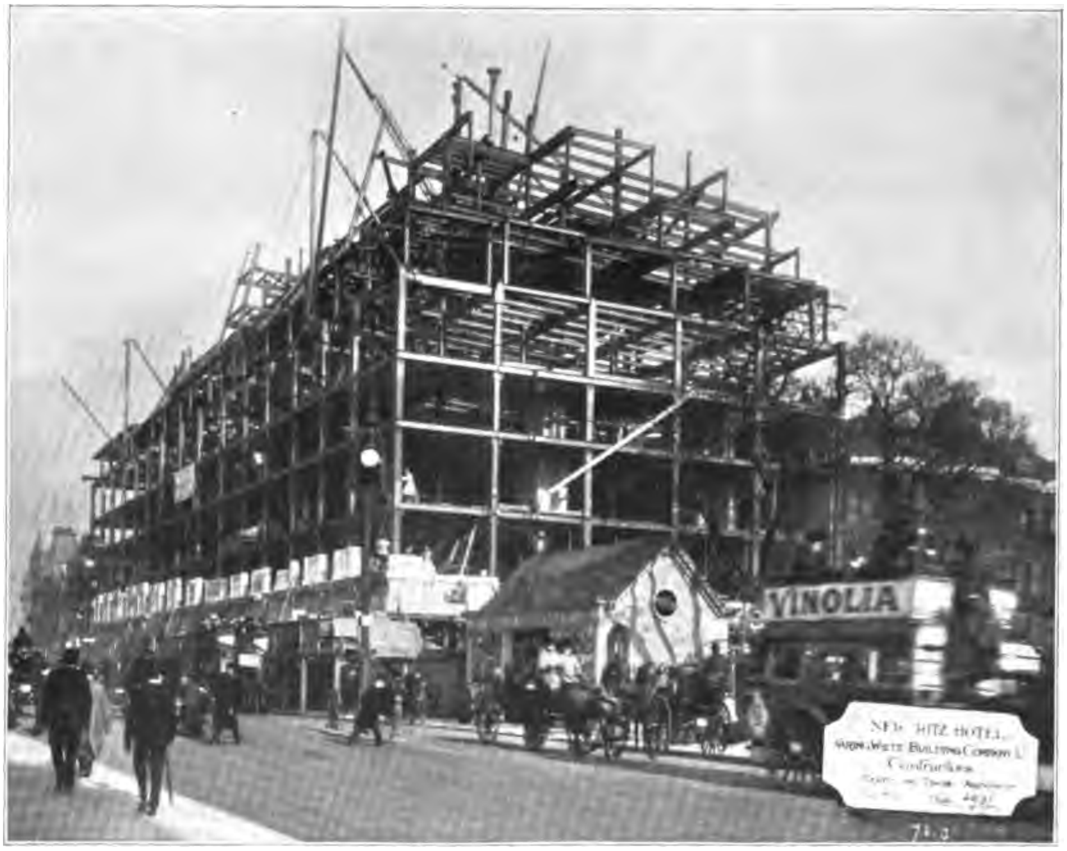


FIG. 3. NEW RITZ HOTEL, LONDON.
From Photograph Taken March 20, 1905. Steel Frame Nearly Completed.

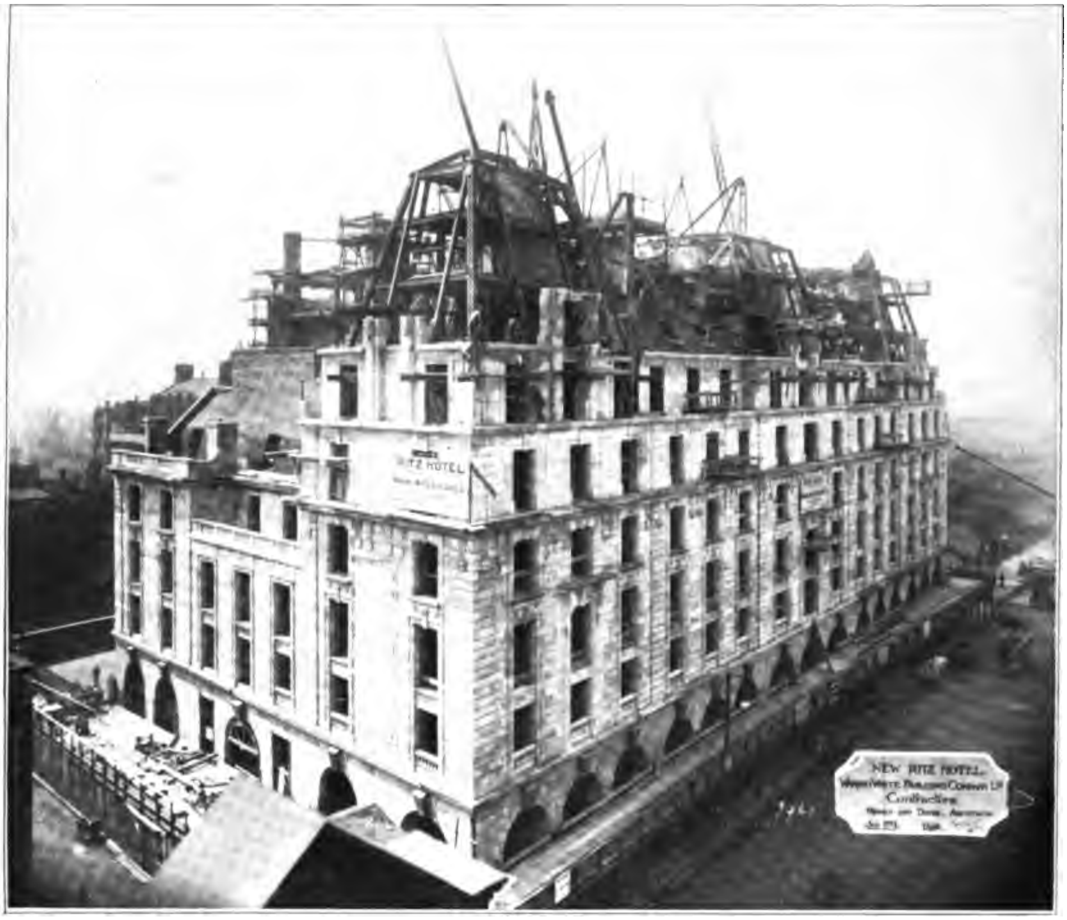


FIG. 4. NEW RITZ HOTEL, LONDON.
From Photograph Taken June 14, 1905. Piccadilly and Arlington Street Fronts.

type, composed of two 12-inch channels and flange plates 14 inches wide, except in the upper tiers, where the loads become light enough to permit the use of latticed channels. The outside dimensions have been kept practically constant, variation in cross section having been obtained by varying the thickness of metal. In a few cases where very heavy loads had to be carried the webs of the channels were reinforced by plates. The columns are all in two-story lengths and are spliced about 1 foot 6 inches above the floor level, the sections being changed at each splice in the usual manner to correspond with the loads to be carried. Both ends of the columns are milled and in the splice is inserted a cap plate or horizontal diaphragm of exact dimensions. The upper and lower sections are securely united by vertical splice plates. The beam connections are of the usual type; that is, with top and bottom angles shop-riveted to the columns, the shelf angles being supported by stiffeners where required. The photograph, taken Nov. 11, 1904, shows these typical column details. The view was taken looking towards Green Park.

The beams throughout the entire structure, where practicable, are spaced 5 feet 6 inches, or less, apart.

On the Piccadilly and Green Park fronts the roof slopes at an angle of 75 degrees, beginning at the seventh floor level and extending to flat roof level. On the Arlington street front it slopes at an angle of 45 degrees, beginning at the fifth floor level.

This irregularity in the roof seemed to require, from an architectural standpoint, that the exterior walls of the higher parts of the building should be set back at the sixth and seventh floor levels in order to preserve the unity of the design. The result was a relatively complicated steel construction, the outside columns in these upper stories having to be supported on cross girders. It is evident that the weight of steel in the building was considerably increased by thus having to provide for these heavy concentrated loads on the cross girders.

This unusual feature of the construction can be seen in the photograph taken March 20, as the sixth-story columns are clearly shown out of line with those below.

The finished effect of the converging walls and the different heights of the two fronts is seen in the final photograph taken June 14 from the corner of Piccadilly and Arlington street.

The very creditable time in which the hotel has been built, as evidenced by the dates of the photographs here reproduced, has been the marvel of English builders. The growth of the steel frame and the subsequent rapid rise of the walls have been watched with great interest and augur well for the future of American methods in England.

REINFORCED CONCRETE

EXTRACTS FROM AN ADDRESS DELIVERED BEFORE THE ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA, BY ROBERT A. CUMMINGS, MEMBER OF THE SOCIETY, AND PUBLISHED IN ITS PROCEEDINGS.

This material has been called by various names, e. g., armored concrete, concrete steel, ferro-concrete and steel concrete, but recent authors generally prefer the term reinforced concrete, which is doubtless the most appropriate of any.

Reinforced concrete is generally made from a combination of Portland cement, water, sand and gravel or broken stone, in which are embedded iron or steel bars in such a manner as to reinforce the concrete, especially where the structure is subjected to tensile stresses. Portland cement mixed with sand and water makes an excellent paint for preserving iron or steel, adhering to the metal very firmly and protecting it thoroughly against corrosion. It can easily be made watertight, and its durability is beyond question. These properties of cement mortar can be utilized in reinforced concrete. This material is well adapted for molding into a monolithic structure, which does not disintegrate when subjected to shocks, such as are produced by railroad trains, and vibrates much less for a given load than structural steel. Correctly designed, reinforced concrete structures are not liable to sudden failures, as is the case with ordinary concrete, but gives warning by the falling off of the surface concrete long before the point of failure is reached.

The writers on the theory of reinforced concrete differ quite widely in their views, but it is hoped that many of the points of difference may be settled by a committee which has been appointed by the American Society of Civil Engineers to investigate the subject in connection with the Engineering Congress.

In Europe various public authorities have investigated reinforced concrete and laid down rules governing the design and materials for structures of reinforced concrete. The regulations of the Prussian government are very conservative. The Swiss government rules for design are based on the method of Ritter, a well-known authority on the subject. There are no uniform rules for design in France; each constructor uses his own methods. New York and Philadelphia are about the only cities in the United States that have formulated any reasonably definite rules on the subject. These rules are incorporated in the building laws, and, in the light of well-known facts, appear unnecessarily severe.

The speaker feels that the materials and workmanship are the most important considerations in reinforced concrete construction, and it is essential that they be as nearly perfect as it is at all practicable to make them.

For Portland cement, the standard specifications of the American Society of Civil Engineers or those of the United States army engineers are good and insure good cement. This is the most important material, as it is that which binds the other materials together, and upon the firmness with which they are bound together depends the strength and durability of the structure. The speaker would call your attention to the boiling test, which is found in some specifications and is sometimes abused. This should be carefully done with clean water, free from mud, acid or alkali. If it boils too violently, it is liable to break the pat of cement. For that reason the speaker prefers the steam test, which is believed to be fully as efficient a test to determine constancy of volume.

The purity and cleanliness of the aggreate are very important points. Good, clean gravel is good, but it is impossible to make good concrete from the gravel that is commonly used in this city, dredged from the Pittsburg harbor and containing large quantities of oil, mud, coal, sewage, etc. Gravel must be thoroughly washed and promptly rejected if it contains oil. Cement will not adhere to anything that is oily. Crushed limestone is good if it is strong, but it must be always borne in mind that no concrete is stronger than the aggregate of which it is composed. Crushed Beaver Valley sandstone is good, but is not very strong in tension. Broken stone makes a stronger concrete than gravel, and for reinforced concrete the speaker prefers an aggregate that will pass a ¾-inch sieve. Small aggregates tamp better around the steel reinforcement. Cleanliness and purity in the sand is at least as important as in the aggregate. The speaker is strongly of the opinion that sand for reinforced concrete should be graded and regulated much as is done abroad. Concrete is like any other manufactured article—it is impossible to obtain satisfactory results without first-class materials properly put together. The French seem to have taken the lead in grading sand for mortars. M. Feret, chief of the laboratory, Ponts et Chaussees, at Boulogne, has recently published the results of some tests in which the sand and aggregate were carefully graded. In these tests everything that is retained on a 5-millimeter (2-inch) sieve is graded as aggregate. Everything that passes a 5-millimeter mesh sieve and is retained on a 2-millimeter mesh sieve is graded as coarse sand; all between 2 millimeters and ½ millimeter (.02 inch) in size is graded as medium sand, and everything finer than that as fine sand. His tests indicate that coarse sand makes a considerably stronger mortar than medium sand, and still stronger than fine sand, that a mixed grade of sand makes the mortar stronger yet, and that the maximum of strength is obtained when the sand is of the coarse and fine grades exclusively, the quantity of the former being double that of the latter.

The proper proportion of the ingredients will depend upon the nature of the work. Water-tight work requires a large proportion of cement, and the greater proportion of cement the greater the compressive strength.

The speaker is of the opinion that the usual method of specifying the proportions of the ingredients of concrete—entirely by volume—is erroneous. He thinks the cement should be specified by weight, and the other ingredients by volume. He knows of a contract in which the engineer specified a certain number of barrels of cement to the cubic yard of sand, etc. The question as to whether packed barrels or loose barrels were meant was decided in favor of the contractor, who thus saved 800 barrels of cement in a very small contract.

The strength of concrete depends largely on the strength of the mortar which it contains; therefore the proportions of sand, cement and water should be determined first. The maximum strength of the concrete will be obtained when the mortar just fills the voids in the aggregate, but on account of the impossibility of obtaining absolutely perfect mixing the mortar must be in excess; in fact, to make a concrete absolutely free from voids, about 40 per cent excess mortar is needed.

Concrete is usually made so wet as to be sloppy. This is done to reduce the amount of ramming necessary, but it is not the best practice. It gives the cement a tendency to work to the top and the aggregate to settle. This is peculiarly objectionable in columns. Wet concrete, however, is almost a necessity in reinforced concrete on account of the practical impossibility of properly ramming dry concrete around the reinforcements. It is, therefore, usual to use a plastic concrete and a large margin of safety in the design. The French determine the proper consistency of mortar for concrete work by specifying that if a sample of mortar be taken out five minutes after mixing its appearance must not change on standing three minutes longer. Another method is to place some mortar on a trowel and drop it off; if it falls off clean, it is wet enough. Another method is to mold a ball of mortar gently in the hand; water should just appear on the surface of the ball. Still another method is to drop the ball twenty inches on to a hard surface; the ball should retain its shape.

For reinforcement, the speaker is in favor of using a medium open-hearth or Bessemer steel, such as is used for ordinary structural steel work. Some use a very high carbon steel, but he is not in a position to indorse it.

JOTTINGS

ABOUT FIRES AS MISDEMEANORS—INCONSISTENT EDITORS—FOREST DENUDATION—WASHINGTON ARCHITECTURE, AND PROSPECTS FOR FIREPROOFING IN THE FAR EAST.

BY F. W. FITZPATRICK.

THE suggestion made in these columns some time ago that taxes be proportioned according to the good or bad construction of buildings upon property has brought me a number of letters from all over the country, commendations, criticisms and suggestions along the same line, some good, some exceedingly silly. One of the best suggestions comes from Chicago in a carefully worded and well-thought letter from a young architect. His idea is that since so many fires are directly attributable to negligence, and the spread of fire in a building is, nine cases out of ten, due almost solely to the imperfect construction of that building, fire really constitutes a misdemeanor, an offense against the public weal and is, therefore, punishable, as is any other wrongdoing on the part of a citizen. Therefore, should a fine be imposed upon the owner of every property whereon a fire originates, according to the amount of damage done by and duration of the fire, which fines would go towards the maintenance of the fire department, thus lessening the burden of that service on the people owning well-built structures or those who exercise greater care and caution against fire. Perhaps a trifle heterodox, but sensible, nevertheless.

* * *

Some newspapers have a peculiar idea of their position as educators, vis-a-vis, their constituents or readers. I had quite a discussion some time ago with an editor of an important paper anent his responsibility towards his readers with regard to fire and the prevention of fire. I pointed out to him that if people generally didn't fully appreciate the importance of proper construction, and all that sort of thing, it was the fault of the newspapers in not devoting more space to the subject. It merited as much attention surely as minor politics, Mrs. So-and-So's dress and the wedding of two more or less unimportant young people. He agreed with me perfectly, and said he hadn't thought of the matter from that point of view, and that during the winter he would like to have a lot of data *et cetera* on the subject of fire losses, means of prevention, and so on. Whereupon I urged that *now* would be as good a time as next winter for him to take hold of his readers in earnest and point out the path they ought to follow. But no, for several months to come every bit of available space was planned for and fully bespoken. Two days afterwards that paper had two solid columns of description of some wonderful invention in the shape of a house of steel frame with an outer and inner shell of glass, glass walls, a transparent house, not needing windows, a most glowing and beautiful description of a very senseless sort of affair. Two columns of it! How much good that fellow could have done with those same two columns devoted to a better purpose.

After all there may be but little use in getting excited over our seeming continued contributions of inflammable structures to the annual "ash-heap." The thing may adjust itself, and before many years. Americans are actually becoming alarmed at the threatened wood famine that hangs over them, and probably, little by little, will resort to other materials for building purposes. Unless some idiotic genius starts up and invents an inflammable material that strikes public fancy a change to almost anything we know of is desirable, for nothing, not even some of the collapsible concrete systems, is quite as pernicious as is the continued use of wood, the building of tinder boxes. That the subject of forest devastation has indeed become a popular one is evidenced by the fact that some days ago, and without any special reason for it, out of fourteen metropolitan papers that I had occasion to go over pretty thoroughly eleven had something to say on the subject, editorially or otherwise. One London newspaper avers that English ash and elm will soon be unprocurable in England, and the English will have to look to America for a supply. A New York paper bemoans the passing of the old worm fence on account of the scarcity of timber, and says that things have come to such a pass that an enterprising Chicago concern is now buying up the old rail fences around the country and is utilizing the walnut therein for commercial purposes. A southern paper says that the timber forests of the Northwest have been practically denuded and that the supply will have to come from the South, and laments the fact that the same methods of devastation that prevailed in the North are being resorted to in handling the southern pine. The Washington *Post,* of the same day, with its wonted directness and clearness editorially, comments thus:

"The country is threatened with a timber famine, and it is predicted that the next generation will find the supply of hardwoods utterly exhausted in all the states. The American farmer is much of a vandal, and during the last century there was wantonly destroyed enough walnut, oak and ash to supply the necessities of our people for hardwoods for decades. But that is past mending, and mills do not grind with the water that went by yesterday. . . . Timber culture is practically unknown to us. And yet timber culture can be made profitable to the planter. An exhausted field devoted to black walnut or locust is soon covered with grass and affords an admirable pasture. In a few years the fertility of the soil is restored and the husbandman reaps a profit every year. There are millions and millions of acres of waste, exhausted and abandoned fields on which valuable timber could be grown. These could be reclaimed and restored to their former fertility if we could induce the American to give a little thought and time to posterity. The man who plants a timber tree works for posterity, but our folks are so hot foot after the dollar that they have no time for tree planting.

"In some of the states of continental Europe no man can fell a tree on his own land without a government permit, which is not granted until he has planted another tree to replace the one he shall cut. In France timber is a regular crop, that is cut when it is ripe and planted in due season. It was such vandalism as we practice in the destruction of timber that made so many deserts in Asia. Trees are the lungs of the earth, and in some parts of the United States the earth has tuberculosis, due to ignorance and unthrift. . . ."

Ah! That is it. Not alone in the way of forest devastation but in many other things are our troubles directly ascribable to our national "hot-footedness" after the dollar. In buildings our people are so anxious to make their 10 or 15 per cent profit this year and next that they care not a rap what may become of those buildings in twenty years. Our national folly has made it so that the earth, as the *Post* says, is suffering from tuberculosis; may we not also say that it likewise has a decided case of fireosis?

* * *

Talking about intelligence reminds me that there seems to be some opposition in San Francisco to the betterment of building regulation proposed by City Architect Shea.

It is claimed that no improvement is required in building methods there, though it is notably a wooden city, and one of the arguments advanced in support of that contention is that the underwriters have made very low rates on San Francisco buildings because of the very great efficiency of the San Francisco Fire Department! By the same token, why should not the hotels in a low miasmetic, typhoidy, unclean, unhealthy place advertise it as a splendid health resort because of the high calibre of its doctors?

* * *

Speaking of San Francisco reminds me that I lately received a communication from an architect there calling my attention to a clipping from the *Literary Digest* of August 12, that bemoans the tendency of present day literature that seems to revel in showing us our sore spots, our corruption, graft and misgovernment. It calls it a tendency towards a "literature of exposure," and protests against it because a continuation in that direction is apt to surfeit us, accustom us to evil and make us look upon it as something ordinary, common, not worth while mending; that there is nothing constructive about that tendency. The writers but point out the evils, show up the wrongs but suggest no cures, no reforms. My correspondent says he doesn't wish to hurt my feelings, but that that particular clipping, he thinks, applies to me. He thinks that in these and other columns I devote too much space and time to facts and figures demonstrating the wrongs in buildings, the ills that result from fires and poor construction, and such "literature of exposure."

Perhaps I am guilty according to the indictment, but I submit that if our western friend will glance over my so-called literature he will find that with a very small proportion of exposure of destructive tendency, I have made it very largely constructive. Indeed, like a certain young gentleman who cried out in the desert æons ago, my voice has been stridently raised in behalf of curative measures for the ills from which we suffer. I have harped consistently and persistenly upon better construction.

* * *

In the revision of building ordinances for different cities commendable zeal is shown by the framers of the regulations in the direction of exacting a better grade and quality of work in new buildings. But it seems to me in nearly every case, at least in those that have come under my hand, not enough latitude is given the executive officers in inspection of old buildings and in enforcement of certain needed precautions against decay as well as fire. And, too, in most cities too little attention is paid to the matter of repairs and additions to old buildings. These are generally looked upon as very immaterial affairs and permits for such work are issued very perfunctorily. Note one of the results in the loss of thirteen lives last month in the collapse of the Myers store in Albany, a case of trying to patch up an old trap, and also the collapse and attendant loss of life in an old New York building reported in the morning papers and another in Boston.

* * *

When it comes to exercising authority in matters artistic Paris certainly is all right. In some of our cities and in England and Germany, where high buildings are frowned upon, practical hygienic and other reasons are advanced for sustaining the objection. London claims that the making of narrow chasms of its streets would affect the health of its people. Berlin don't want any building over which its fire department cannot throw water from the street, and so they go. But in Paris the American Ice King's (C. W. Morse) proposal to erect a twenty-story skyscraper hotel has been flatly set upon and a permit refused because "such a building would mar the general, the artistic effect of the city." Good for Paris!

Paris, if things go on as they have started of late, will not be the only artistic city. Most hopeful signs are seen in Washington every day. Architectural signs, I mean.

But a short time ago any man who received a commission to do government work, here, immediately felt it incumbent upon himself to do something extraordinary, something that would completely dwarf everything else and that would attract all the attention to itself. Such an idea as keeping in consonance, in harmony with the others was never dreamed of. An attempt to fit the new structure into some general scheme of city improvement, balancing it with some other building or, under certain circumstances, subordinating it, was the last thing that the average architect would hark to. Take, for instance, in our Congressional Library, a building that by itself is certainly sightly, imposing and attractive. Placed somewhere else in the city, where it could properly predominate, it would be most excellent as it is, but as a building adjacent to the capitol, a part of that capitol, indeed, necessarily a subordinate structure, merely an accessory, a convenience, its designer certainly fell down very flat. The building in its ornateness is really impudent; instead of being subordinate to it vies with the capitol in an attempt to secure the greater attention. Its dome, though but a little fellow, is an affront to the grand dome that o'ershadows it. The whole composition is belligerently aggressive.

Architects of artistic temperament have inspired architectural societies, journals and even the public press to correct all this misguided effort and have gotten it even so that things of that nature are more or less directed by a Commission of Architects—unpaid though they be! A general plan has been adopted, new structures preponderate or become subordinate to others in accordance with their relative importance, the general practitioner has fallen into line and improvements are everywhere to be noted.

The two most conspicuous examples of this common-sense tendency are the two office buildings now under erection for the senators and representatives. Those buildings are at opposite ends of the capitol and were designed by Carrere & Hastings—who likewise have the alterations of the capitol itself in charge—than whom no architects in the country have a better grasp, comprehension of and appreciation for the eternal fitness of things. Both buildings are for identically the same purpose, both should very properly be exceedingly subordinate to the capitol, quiet and discreet in treatment and but serve, architecturally, as a step up, a foil, an interposition as it were, between the minor private buildings to the east of them and the great central feature of the capitol itself. The architects have grasped all this, I say, have set aside the opportunity to do something extraordinary and attract attention to their particular effort, and the result is most pleasing indeed. The buildings are very large, covering pretty nearly a whole square each, yet they are kept low, but three stories in height, a good rusticated base surmounted by a two-story colonnade of graceful proportions topped out with a plain ballustrade, *sans* dome or minaret or spire or other topknot to detract the eye from the crowning feature of the whole composition, the dome of the capitol. Neither is one given any importance over the other, for both are substantially identical in design. Altogether the handling of those two buildings deserves our highest commendation, our gratitude even, and the closest study of all students of the art architectural who wish to do things as they ought to be done.

* * *

And, spite of our misgivings, peace has finally been arranged in the Orient. It certainly came as a surprise even to many of us who thought ourselves pretty well posted in the matter. It means much, not only for both countries, but for all of us. The

Japanesing of Corea and the naturally resultant predominence of Japanese influence in all matters Chinese is going to give a tremendous impetus to oriental commerce. Railroads, particularly, will be stretched out in every direction. Those not on the inside have no idea of the extreme activity of the representatives of oriental countries hereabouts in not only making inquiries, but actual purchases of material and contracts for railway and other improvements. Hand in hand with railroading will naturally go building. The orientals, particularly the Japanese, spite of their early training, their traditions, their hereditary bamboo tendencies, take kindly to good construction. In Tokyo especially, unless there is a money crisis, a remote contingency, another year will see a dozen pretty good fireproof structures under way. For the time being the tile work, I suppose, will have to be shipped from this country, but I doubt if it will be long before the very adaptive little fellows will be building kilns of their own and baking their own tile, and then I suppose about that time our concrete friends will be getting after them, extolling the hidden and beautiful qualities of cinder spans and the very special virtues of the two hundred and sixteen different (and each one the best) re-enforced weaknesses, I mean systems. And presumably, a little while after that, we will be hearing about the Kitisuro, the Sumtu, Huyisha and such systems. Undoubtedly, too, for the Russians are bound to progress (?) in that direction, it may not be long after that again that we will hear of the Ferro-Kcirtapztif, or the Waterandmudoski-concretovitch systems.

And so the world goes on. What a whirligig we are in! Still, it is interesting, and who would willingly be out of it?

THE BRICKBUILDER FIREPROOF HOUSE COMPETITION

REPORT OF THE JURY OF AWARD

Reprinted by permission from The Brickbuilder, July, 1905.

THE undersigned committee, having carefully examined the various designs submitted in competition for a fireproof house, of which the programme appeared in the issue of *The Brickbuilder* for March, 1905, have decided that the first prize should be awarded to the design submitted by "Vassy" (B. C. Flournoy); the second prize to the design submitted under the device of a hollow fireproof block inclosed in a circle and two squares (Henry Brooks Price); and the third prize to the design submitted under the symbol of "Tau Beta Pi" (Joseph W. Wilson). Mentions have also been awarded to the four designs by "Fornax" (Gordon B. Pike and William L. Welton), by "Commuter" (Russell Eason Hart), by "Humus" (W. Pell Pulis) and by "Juniperre Serra (Walter E. Pinkham).

The programme calls for a house, the walls, floors and partitions of which are to be of terra cotta hollow tile blocks, and its expressed object is to encourage ingenuity and resource in the employment of structural clay products in an artistic, practical and inexpensive manner, and to bring out designs expressive of the materials employed.

The design to which first prize has been awarded, while lacking in the interesting study of detail shown in the drawing given second prize, represents a well-proportioned building entirely possible of construction within the limits of cost mentioned in the programme and showing in its detail a logical and pleasing use of the materials available. The simple treatment of the terra cotta cornice and its moderate projection beyond the wall, together with the horizontal stringcourse and the treatment of the quoins and arches over the doors and windows, stamp it unmistakably as a burnt clay construction in which the use of stucco has merely been resorted to as a covering for certain portions of the wall and not as a concealment of the structural facts.

The design awarded second prize is the only one which indicates a thorough appreciation on the part of its author of the primary objects of this competition. Both in general design and in detail it shows intelligent study of the decorative possibilities of the rough structural materials prescribed for the building, and from that standpoint it is regarded as the most meritorious of the designs submitted, in most of which the actual structural materials are concealed for the most part by a covering either of stucco or brick. In spite of the fact, however, that it stands alone as a successful solution of the primary objects of the competition, it is so obviously in excess of the cost limitation of the programme, both in size and in the scope of its composition, as to be debarred from consideration for the first prize.

The drawing to which third prize has been awarded, while equally successful as a design for an inexpensive building of this character, fails to give any adequate exterior expression to the materials of its construction. In fact, it might be readily constructed of wood and wire lath. The prize that has been awarded to it, therefore, represents rather an acknowledgment of the general excellence of the design than a tribute to its success in meeting the particular requirements of this competition.

The same remark would apply to all those designs to which mentions have been given, which, moreover, are for the most part obviously in excess of the cost limitation.

It may be added that the design submitted by "Fornax," to which a mention has been awarded, is architecturally the most interesting of all those submitted. In size and general composition it is well within the limits of cost established, but its lavish use of highly enriched "architectural" terra cotta renders it inappropriate under the programme for consideration as a prize design in this competition.

In conclusion it should be said that, while this competition has brought out many designs of considerable architectural merit, the result is, in some respects, disappointing, in that there are but few among them all showing any decided resource in the utilization of materials which are rich in interesting decorative possibilities.

William Rutherford Mead,
William A. Boring,
Arnold W. Brunner,
J. Monroe Hewlett,
John Russell Pope,
Jury of Award.

Estimated Cost of Houses Shown in the Three Prize Designs.

[These figures were submitted by the designers.]

FIRST PRIZE DESIGN.

ESTIMATED COST OF CONSTRUCTION.

Excavation	$ 50.00
Concrete footings and cellar floor	150.00
Structural terra cotta	4,218.00
Architectural terra cotta	312.00
Roofing tile	450.00
Rough cast (outside walls) and plastering	550.00
Tile floors in hall, kitchen, pantry and bathrooms	$ 360.00
Metal work, tin roofing, etc.	150.00
Structural steel	60.00
Wood framing and sheathing for roofs.	350.00
Finished carpentry	1,300.00
Hardware, painting and glazing	250.00
Plumbing	750.00
Heating	750.00
Total cost	$9,700.00
Substituting steel framing for wood in roof, add	250.00
Total cost with steel roof framing.	$9,950.00

SECOND PRIZE DESIGN.

ESTIMATED COST OF CONSTRUCTION.

"The cost to build the design herewith submitted, in the vicinity of New York, is estimated to come within the proposed limit of $10,000.

"This estimate is based on information received by me to the effect that a house of proposed character can be built for from 17 to 18 cents per cubic foot.

"Also from figures and price lists received by me from manufacturers of proposed material and figures received for interior finish, heating, plumbing and lighting, viz.:"

SHELL:

Outside Walls:			
8-inch T. C. building blocks with 4-inch furring, 3,792 sq. ft. at 30 cts.	$1,137.60		
8-inch brick with 4-inch furring, 714 sq. ft. at 32 cts.	228.48		
		$1,366.08	
Floors:			
Johnson system long span T. C. arch, 5,916 sq. ft. at 30 cts.		1,774.80	
Partitions:			
6-inch, 3,705 sq. ft. at 12½ cts.	$ 463.32		
4-inch, 1,142 sq. ft. at 11 cts.	125.62		
3-inch, 355 sq. ft. at 10½ cts.	37.28		
		626.22	
Porches:			
9,596 cu, ft. at 15 cts.		1,439.40	
Roof:			
10,353 cu. ft. at 15 cts.		1,552.95	
			$ 6,759.45

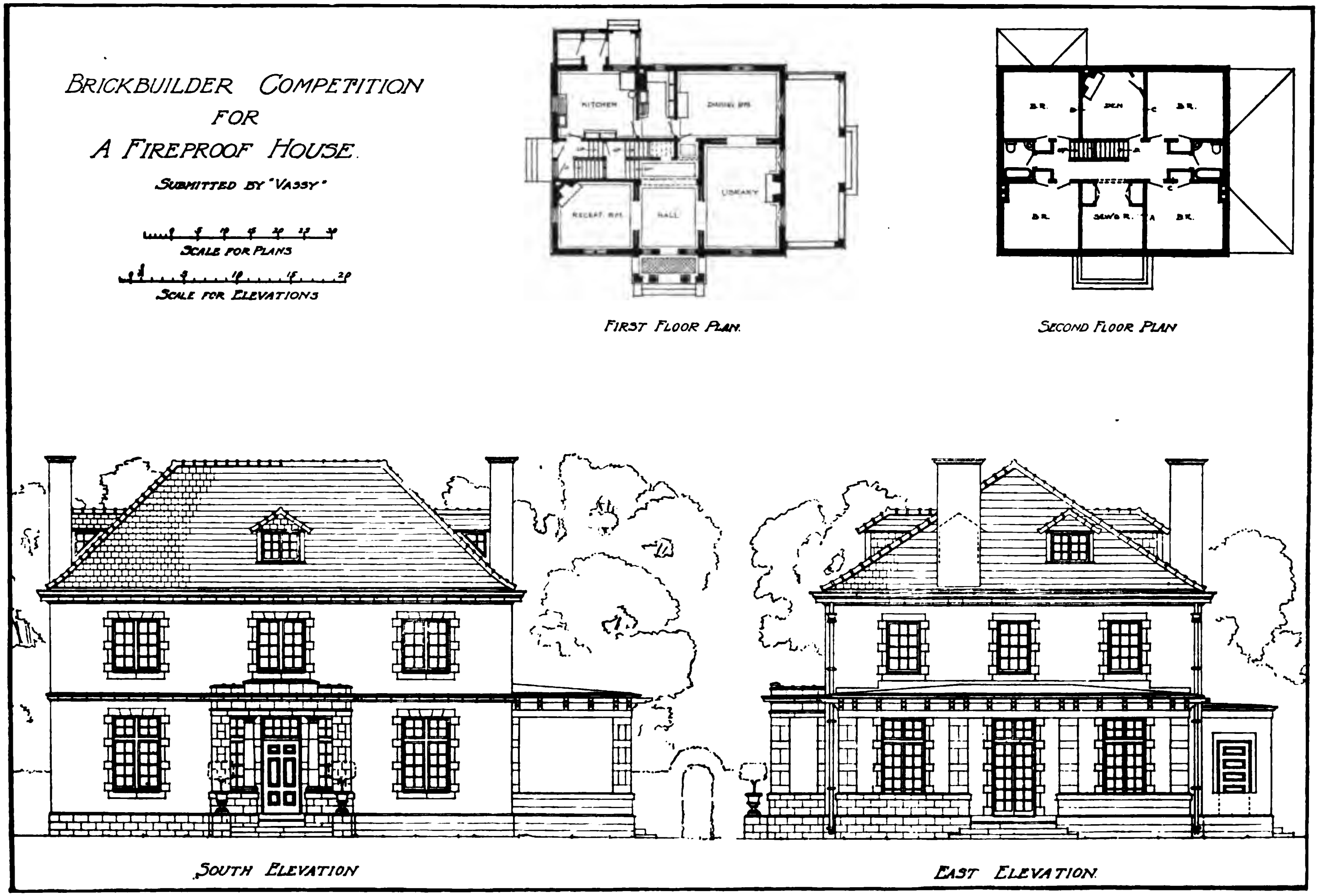


PLATE 1. FIRST PRIZE DESIGN. SUBMITTED BY B. C. FLOURNOY, WASHINGTON, D. C.

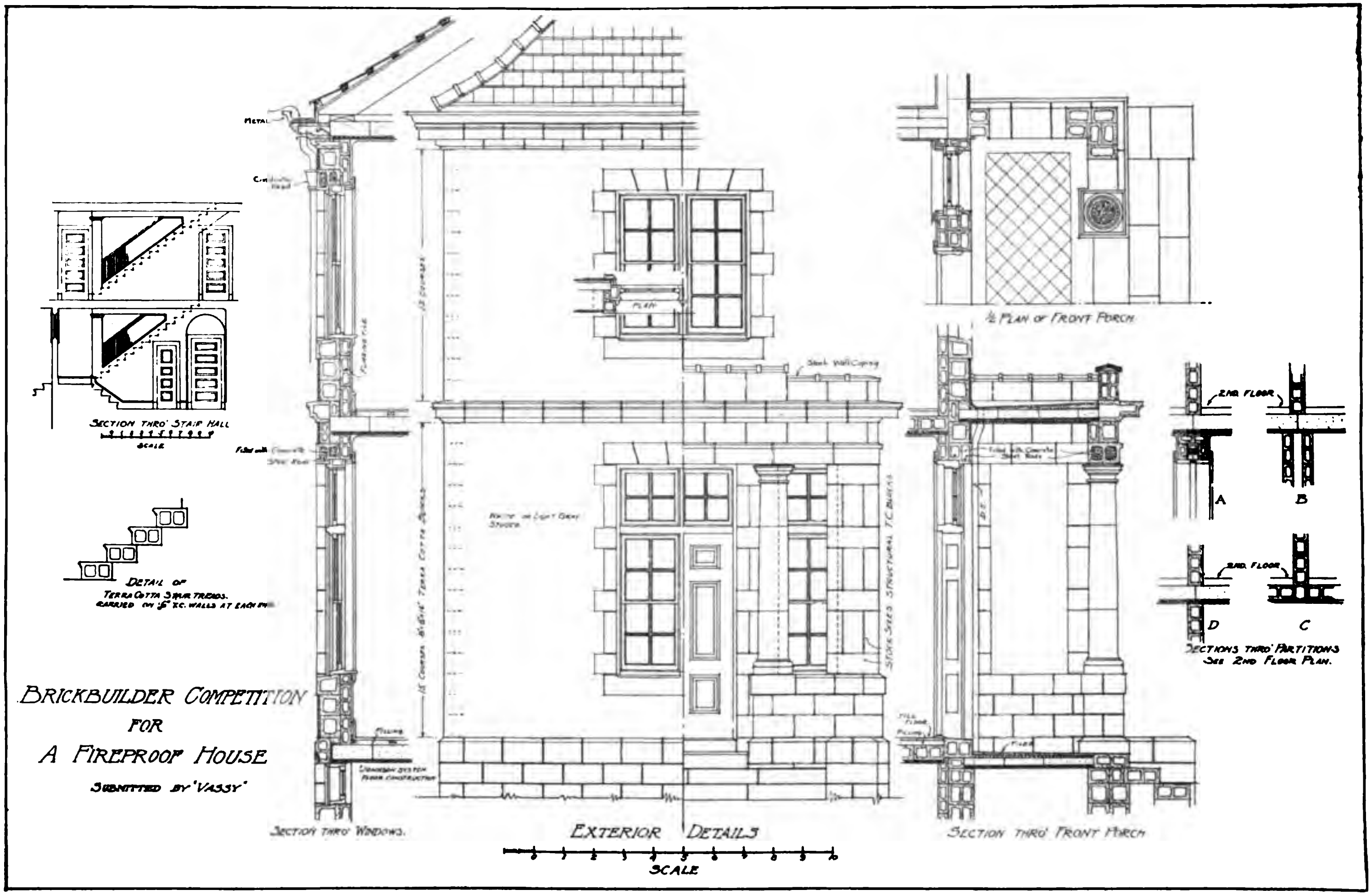

BRICKBUILDER COMPETITION
FOR
A FIREPROOF HOUSE
SUBMITTED BY 'VASSY'
SECTION THRO' STAIR HALL
SCALE
DETAIL OF TERRA COTTA STAIR TREADS. CARRIED ON 6" T.C. WALLS AT EACH END.
METAL
Conductor Head
Filled with Concrete Steel Rods
Furring Tile
15 COURSES
Furring
Johnson System Floor Construction
15 Courses 8½"x16" Terra Cotta Blocks
White or Light Gray Stucco
Plan
Steel Wall Coping
Stock Sizes Structural T.C. Blocks
SECTION THRO' WINDOWS.
EXTERIOR DETAILS
SCALE
½ PLAN OF FRONT PORCH
Filled with Concrete Steel Rods
Tile Floor
Furring
Tiles
SECTION THRO' FRONT PORCH
2ND FLOOR
A
B
D
C
SECTIONS THRO' PARTITIONS SEE 2ND FLOOR PLAN.

PLATE 2. DETAILS BY B. C. FLOURNOY. FIRST PRIZE.

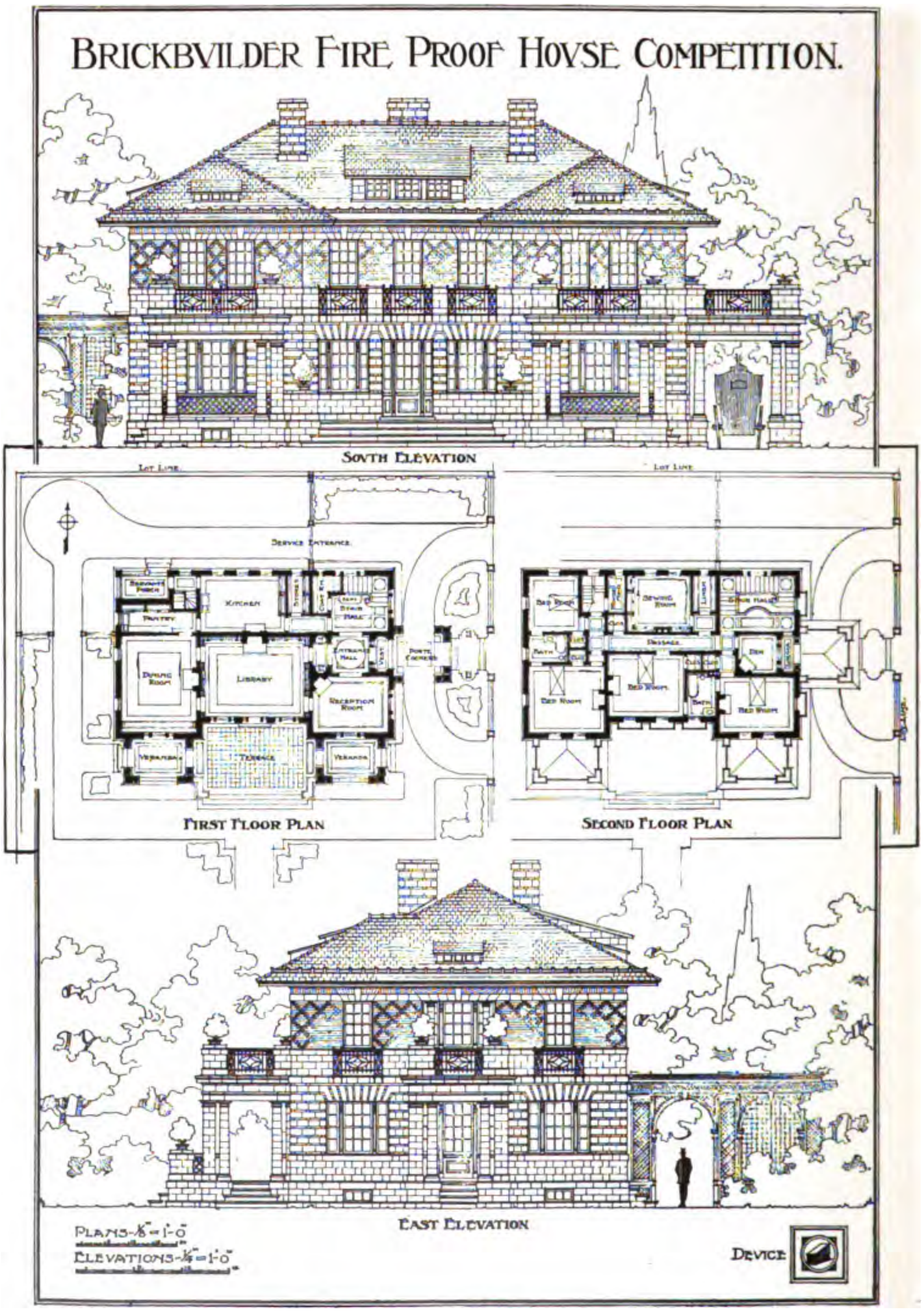


PLATE 3. SECOND PRIZE DESIGN. SUBMITTED BY HENRY BROOKS PRICE, NEW YORK CITY.

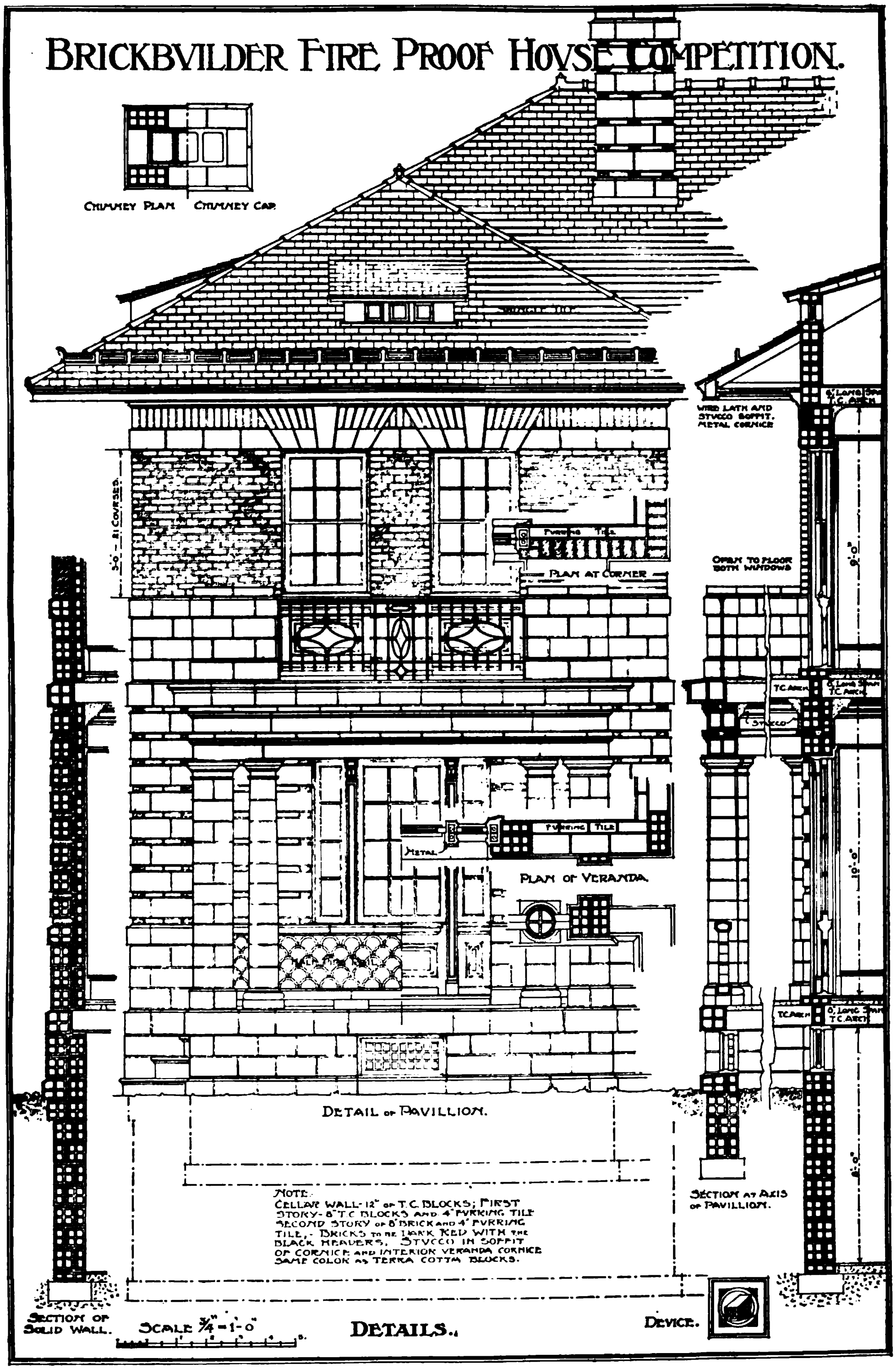

BRICKBVILDER FIRE PROOF HOVSE COMPETITION.
CHIMNEY PLAN
CHIMNEY CAP
3'-0" - 21 COURSES
PLAN AT CORNER
FURRING TILE
WIRED LATH AND STVCCO SOFFIT. METAL CORNICE
6' LONG SPAN T.C. ARCH
OPEN TO FLOOR BOTH WINDOWS
9'-0"
T.C. ARCH
STVCCO
METAL
PLAN OF VERANDA.
10'-0"
DETAIL OF PAVILLION.
NOTE:
CELLAR WALL - 12" OF T.C. BLOCKS; FIRST STORY - 8" T.C. BLOCKS AND 4" FVRRING TILE SECOND STORY OF 8" BRICK AND 4" FVRRING TILE, - BRICKS TO BE DARK RED WITH THE BLACK HEADERS. STVCCO IN SOFFIT OF CORNICE AND INTERIOR VERANDA CORNICE SAME COLOR AS TERRA COTTA BLOCKS.
SECTION AT AXIS OF PAVILLION.
6'-0"
SECTION OF SOLID WALL.
SCALE 3/4" = 1'-0"
DETAILS.
DEVICE.

PLATE 4. DETAILS BY HENRY BROOKS PRICE. SECOND PRIZE.

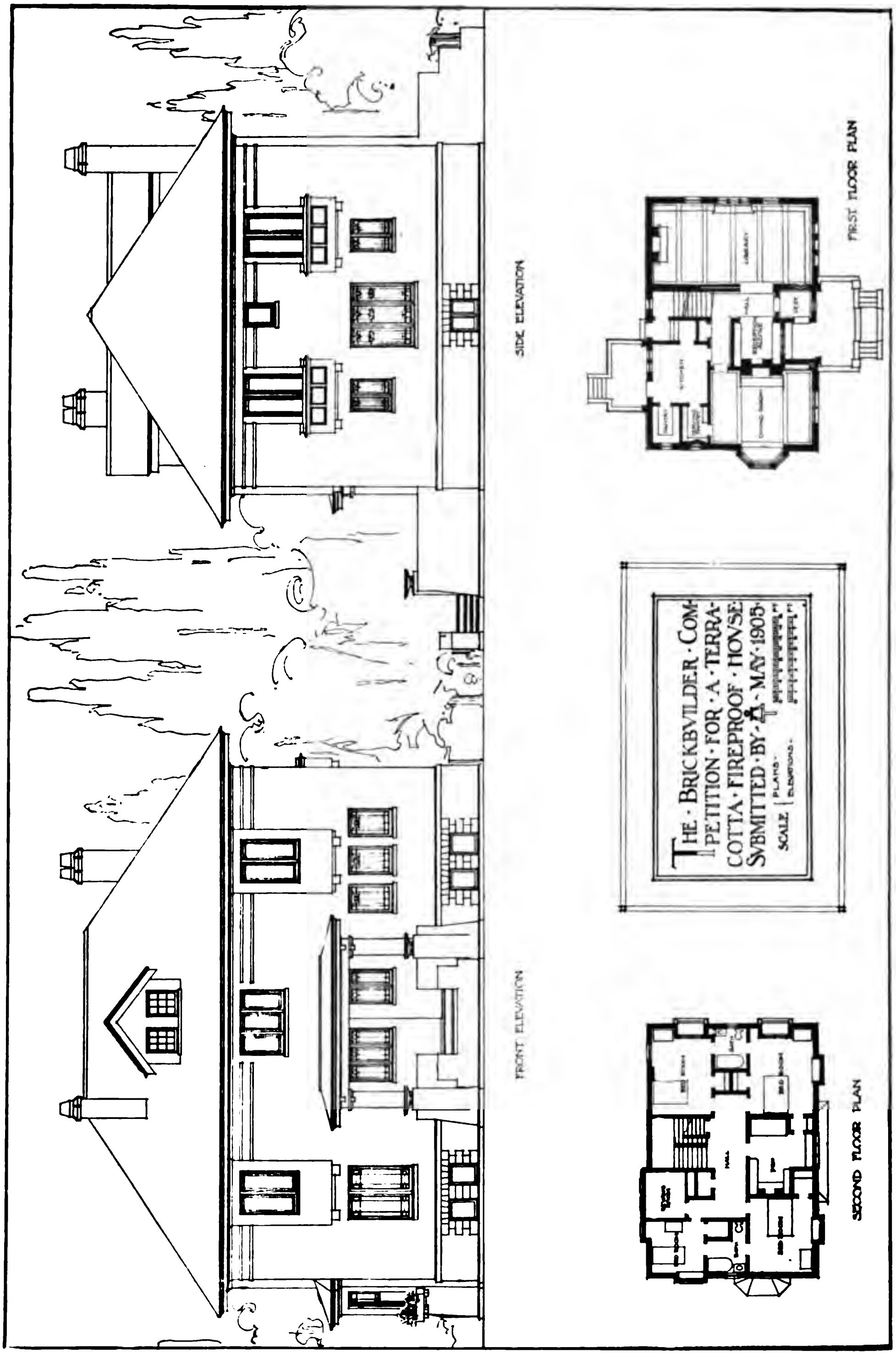

SIDE ELEVATION
FRONT ELEVATION
FIRST FLOOR PLAN
SECOND FLOOR PLAN
THE · BRICKBVILDER · COMPETITION · FOR · A · TERRA-COTTA · FIREPROOF · HOVSE · SVBMITTED · BY · · MAY · 1905 ·
SCALE | PLANS · ELEVATIONS ·

PLATE 5. THIRD PRIZE DESIGN. SUBMITTED BY JOSEPH W. WILSON, CHICAGO, ILL.

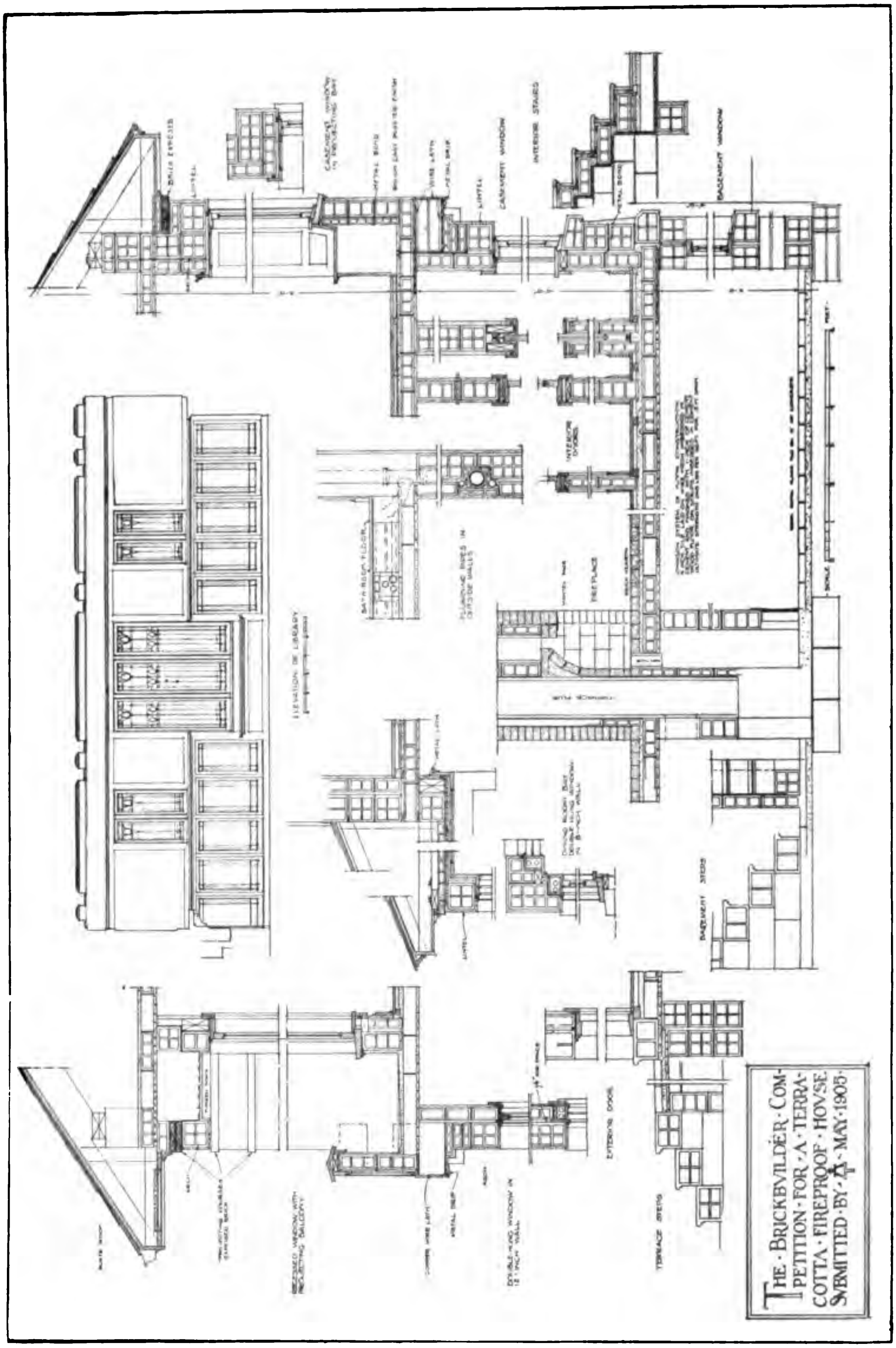


PLATE 6. DETAILS BY JOSEPH W. WILSON. THIRD PRIZE.

Interior finish	1,425.00
Heating	425.00
Plumbing	400.00
Lighting	225.00
Incidentals	765.55
Total cost	$10,000.00

THIRD PRIZE DESIGN.
ESTIMATED COST OF CONSTRUCTION.

Excavating	$ 195.00
Basement floor	175.50
First, second and third floors at 20 cts.	883.00
Outside walls	1,466.00
Inside walls	622.50
Terraces	$ 150.00
Plastering outside	250.00
Plastering inside	553.00
Mill work	2,240.00
Painting and glazing	300.00
Metal bar glass	175.00
Plumbing	980.00
Hardware	150.00
Fixtures	150.00
Electric wiring	125.00
Heating	990.00
Sheet metal and roofing	445.00
Roof framing	150.00
Total cost	$10,000.00

ENGINEERING DEPARTMENT, BUREAU OF BUILDINGS, NEW YORK CITY

THE annual report for 1904 of Mr. R. P. Miller, chief engineer of the Bureau of Buildings, New York City, contains many interesting statements, from which the following extracts are made:

Primarily the engineering force exists for the examination of plans and specifications for new buildings and alterations. The number of such applications is given in the statement of the plan clerk as 4,121, representing an estimated value of about $84,000,000.

During the spring and early part of the year the applications are more numerous than in the latter part, so that for part of that time four assistant engineers and one inspector are steadily engaged on this work. When this work falls off, one or two of these men are engaged in outside inspections and examinations, so that the work is done on an average by four men, or about 1,000 applications to each man. When it is remembered that these applications are amended from time to time for various reasons, averaging two times for each application, the amount of work done will become evident.

Next in importance to plan examinations is the work done in connection with the supervision of tests of new materials and construction. During the year just closed the following tests have been made under the supervision of this bureau: Ten fire and water tests, conducted according to the requirements of Section 106 of the building code, were made on various forms of fireproof floors; eleven load tests were made, of which nine were on modified forms of constructions already approved, and two on floors in buildings in course of erection, where some doubt as to their strength or construction existed. Of these twenty-one tests, five fire tests resulted in failure, five fire tests were successful, eight load tests established the working loads for the types under consideration, and the other three proved the safety of the constructions for assumed working loads. As a result of tests, approvals for twelve new types were issued.

Considering the tests in more detail: Four of the fire tests were on concrete-steel construction, in which a 1:2:4 stone concrete, reinforced by steel bars of various shapes, was used for not only the floor constructions, but also for the girders and columns, and which come under the concrete-steel regulations issued by this bureau in 1903. Two of these tests resulted in failure. The other six tests were on floor fillings between steel beams. One of the successful constructions consisted of reinforced stone-concrete lintels resting on the lower flanges of the steel I-beams. Two long-span tests were made on stone concrete slab constructions, reinforced with expanded metal, one being successful, the other not. Two cinder concrete constructions were tested, only one of which was successful. Finally a terra cotta floor construction was tested, resulting in failure.

Eight cinder concrete floor fillings were tested to destruction by loading, all being on modified forms of constructions already approved. These tests were made to establish the working loads to be used for those particular types, such load being one-tenth of the load at which the construction failed in each case. A similar load test was also made on a 25-foot span of Guastavino arch construction, the test not being carried to destruction, as the abutments began to yield before there was any sign of failure in the arch. The remaining two tests were made in buildings in course of construction, to establish their ability to safely carry the loads for which they were designed. One was on a segmental terra cotta arch; the other on a cinder concrete slab. In both cases the safety of the constructions was established.

During the year seven fire tests have been made, under the supervision of this bureau, on fireproof partitions. As a result of these tests, approvals were issued for five forms of construction.

Other tests, in connection with the work of the bureau, were as follows: Tests on new materials of construction, as provided for in section 20 of the building code, were made on sand-lime brick and artificial stone, and included compression, transverse, absorption, freezing and fire tests. The results were only partially satisfactory, and have raised the question whether the standard fixed by this bureau is not too high. An investigation into this matter is now under way, and it is hoped that as soon as the experimnets now being made are completed the matter will be definitely settled. A report may be expected early next year.

Numerous solutions and paints for the fireproofing of fabrics, scenery and woodwork on theater stages were submitted to this bureau for test during the year. All of the samples submitted made a good showing, but no approvals were issued, inasmuch as results in actual practice cannot be judged from samples. Acceptance of the treatment depends on tests made on the materials in each individual case, and a certificate is issued where the following specifications of this bureau are met:

In the case of fabrics, scenery and the wood frames for the same, there must be no flame or glow after the application for fifteen seconds of the flame of an ordinary alcohol lamp or torch.

In the case of so-called fireproof paints, the following regulations have been adopted:

(1) The term "fireproof paint" shall be understood to mean any preparation used to cover the surfaces of wood or other materials, for the purpose of protecting the same against ignition.

(2) No fireproof paint will be considered satisfactory unless it so protects the wood or other material to which is it applied that the same will not flame or glow after having been subjected to the flame of a gasoline torch for two minutes.

(3) Before applying fireproof paint to any material the surfaces must be cleaned.

(4) Application of fireproof paint must be repeated whenever it is found that the material to which it is applied is no longer protected to fulfil specification No. 2.

THE INSURANCE OFFICES AND REINFORCED CONCRETE

(From the *Builders' Magazine*, London.)

THE insurance companies as represented by the Fire Office Committee have issued a guide to those using reinforced concrete, which practically means that the insurance companies have specified the conditions under which they will accept the risk of reinforced concrete buildings from the fire point of view. While so much has been heard of this system of construction and its advantages, it has yet been apparent to those interested in fire protection that there are certain grave risks in the application of reinforced concrete from the fire point of view, and although legislation has so far done nothing in the direction of safeguarding the owners and occupiers of buildings so constructed, it is only a question of time until special bills must come into force on this matter.

In France and in the United States the rudiments of fire prevention have been sinned against in the most callous manner by the firms connected with reinforced concrete work, and it is, we think, only due to the propaganda in Great Britain on this point that more attention has been paid to this matter of late both in the United States and on the Continent. Notable warehouses in this country erected of reinforced concrete are distinctly of a very dangerous character for the simple reason that the metal work is not sufficiently protected by the concrete covering, and thus must be affected by heat and practically result in collapse if their contents were to get well alight.

With the new fire insurance companies' rules we think the metal work in reinforced concrete will be suitably protected. We think that with the advent of the Fire Office Rules the ferro-concrete manufacturers will realize that the fire question will have to be seriously considered in this country, and the moment they thoroughly realize this, as has already been the case with one or two individual firms, the only one remaining disadvantage of the general application of the reinforced concrete will be swept aside. It is in the interests of the reinforced concrete constructors, in the interests of our cement industry, and in the interests of economical building that reinforced concrete should not be associated with any such disadvantage as that of neglect in respect of fire-resisting qualities, and all those interested in the advent of reinforced concrete must thus appreciate the fire offices' requirements and see in them a matter for congratulation.

As to the tenor of these rules, we present them in extract, and at the same time we think we should indicate at this point that one of the leading French firms is at the moment preparing to demonstrate at the London testing station the fire resistance of a reinforced concrete floor if constructed in accordance with fire-protective requirements, the fire test being with a floor measuring 15 ft. by 22 ft.

RULES AS TO REINFORCED CONCRETE CONSTRUCTION.

Buildings constructed with concrete reinforced in every part with embedded metal rods, or bars spaced not more than 12 inches apart, securely connected or overlapping at least 6 inches at all abutments and intersections, having also bands or bars across the thickness of the concrete, may be deemed of standard fire-resisting construction, provided they conform to the ordinary fire office rules with the following modifications:

Rule 3. Concrete may be composed of sand and gravel that will pass through a ¾-inch mesh, or of the other materials mentioned in the rule, but in any case the cement used must be Portland (equal to the British standard specification of December, 1904) in the proportion of 6 cwts. of cement to each cubic yard of concrete. The concrete must be thoroughly mixed both dry and wet and must be rammed round the metal work in position, every part of which must be completely enclosed with solid concrete.

Rule 4. No external wall to be less than 6 inches and no party wall less than 13 inches thick in any part.

Rule 7. Flues may be built of reinforced concrete as described not less than 4 inches thick, if lined throughout with fireclay tubes not less than 1½ inches thick. No timber or woodwork to be in contact with such flue.

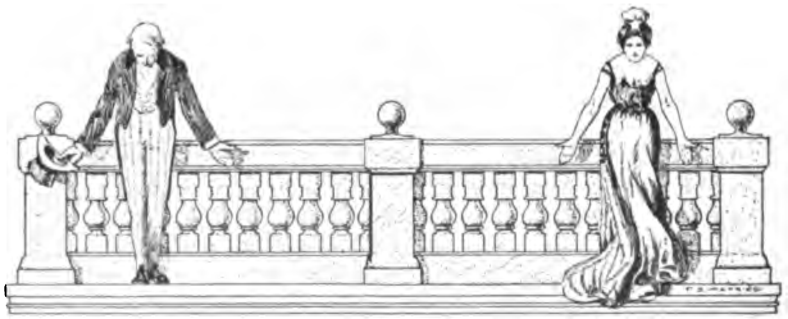
Rules 10 and 11. Floors must be constructed of reinforced concrete as described not less than 5 inches thick in any part without woodwork bedded therein, supported on beams and columns of similar reinforced concrete.

Rule 13. Roofs must be constructed in a similar manner to floors, the concrete in no part to be less than 3 inches thick.

Rules 14, 15 and 16. All structural metal work must be embedded in solid concrete so that no part of any rod or bar shall be nearer the face of the concrete than double its diameter; such thickness of concrete must be in no case less than 1 inch, but need not be more than 2 inches.

Rule 22. Fireproof compartments in connection with reinforced concrete structures must also be of reinforced concrete as described, with walls not less than 9 inches and floors not less than 5 inches in thickness.

Rule 18. Enclosure to staircase and hoist, if of reinforced concrete as described, may be 6 inches in thickness.



OUR NEW YORK LETTER

RAILROAD TERMINALS IN NEW YORK

New York, August 24, 1905.

THE total destruction of the Hoboken terminal of the Delaware & Lackawanna Railroad in August has resulted in some contemplated changes in the construction of railroad terminal stations and car sheds in New York, Hoboken and Jersey City, and if the improvements are made along modern lines of fireproof building it may be said that the extensive conflagration has not been without its lesson for good. The Lackawanna road no sooner had its station, ferry, piers and car sheds swept out of existence than it proceeded to plan for a new terminal which would excel anything ever before attempted by the road. References have been made to the new terminal station which, with other improvements, is to cost upward of $3,000,000, and be absolutely fireproof in construction. According to the plans drawn the building will be entirely of steel, concrete, brick, terra cotta and burnt clay tiles. The main waiting room will be 100 feet square and 54 feet high. There will be numerous waiting rooms, restaurant, smoking rooms and parcel rooms opening into the main room, while a wide concourse will be constructed to give access to the second deck of the boats. The steps leading to this upper concourse will be constructed of concrete. All steel work and partitions will be protected with terra cotta or glazed bricks and the interior finished off with various colored tiles.

The reconstruction of the Lackawanna terminal is in keeping with the important changes going on in the rebuilding of most of the railroad terminals in New York at this present moment. The terminal problems in New York have been difficult of solution, and they have caused a good deal of bother to the leading railroads. Expenditures made within the past two years by the railroads entering New York and Jersey City will show investments in terminal improvements approximating $125,000,000. These, of course, include purchase of lands and enlargement of yards and purchase of track rights. The terminal stations have not yet been all definitely formulated, but the different companies are building for permanency, and undoubtedly all of the buildings will be of fireproof construction throughout.

The New York Central is planning to rebuild the Grand Central depot on a colossal scale, and the Pennsylvania will build an equally immense depot in the heart of New York. The Erie has partly formulated plans for a new depot at Hoboken, with new ferries and terminal car sheds. The Long Island Railroad builds a joint terminal structure with the Pennsylvania and another huge building in Brooklyn where the tunnel begins under the East River. Several smaller piers and buildings by the West Shore and Jersey Central add nearly five millions more to these investments.

The most costly mistakes have been made in the past in building railroad terminal depots in and near New York, and the history of the makeshift changes and improvements is full of short-sighted planning. It is true that a good deal of the waste resulting therefrom was due to a failure to appreciate the rapid development of the city's traffic. Railroad engineers and architects admit that in the past ten years some $30,000,000 have been wasted in tinkering with inadequate terminals, or at the rate of nearly $3,000,000 a year. While the New York Central has been the heaviest sufferer in this respect, all the other roads have had their share of bitter experience. There has been required a constant enlargement of old terminal facilities to accommodate the expanding traffic, and the result has always been that the stations have been far from fireproof. In a good many instances flimsy additions have been built upon the main structures, and the terminals have, as a consequence, assumed an irregular, rambling group of structures that were as inartistic as unsafe.

The fire question has always been important to the great railroads, and in many instances they have been anxious to construct buildings that would be safe from fire. None of the eastern roads build wooden stations along their lines, and even the smallest and humblest is constructed of brick and terra cotta. Their large terminal depots in and around New York have often been the weakest and most unsafe of all their structures. And yet they have made the effort several times to protect themselves in this respect. When the Grand Central was rebuilt a few years ago it was supposed to represent the latest in fireproof construction, and it was a pretty substantial building of concrete, structural steel, brick and stone. But it is not fireproof in the modern understanding of that word.

It is quite evident, however, that a complete revolution is being made in these railroad terminals in the city. The trunk lines are building now for the future, and provision is made for rapid increase of traffic. As a result of this the new terminal buildings will represent the highest in many respects of modern fireproofing methods. Engineers and architects have sought to combine the artistic and the useful, and while in some details safety is sacrificed for ornament, on the whole the results are gratifying.

Railroad fire losses have always been heavy, and small fires occur almost every week on some of the lines of the Pennsylvania and New York Central, but these small fires are usually looked after by the special insurance funds of the railroads. A good many of the leading railroads assume the greater part of their own fire risks, and by accumulating their own "insurance funds" they save a good deal. The Pennsylvania set the standard of railway insurance nearly a quarter of a century ago, and since then most of the other large lines have followed this early example. Prior to that period all the railroad property insured was carried by the regular insurance companies, and the annual expenditures in premiums were important items. Some of the railroad property was considered such bad risks that the insurance companies refused to accept them except at very high premiums. The buildings in the railroad terminal yards were constatntly exposed to the danger of fire from the engines, and, with oil and waste scattered pretty freely around, the encouragement to conflagrations was general.

The "blanket insurance" system is to-day adopted by the leading roads for nearly all their property outside of the larger city terminals. Such railroad terminal fires as destroyed the Lackawanna piers and ferries, the Illinois Central's fire at New Orleans, the Grand Trunk fire at Toronto, and the general destruction of railroad property in the Baltimore conflagration fall heavily upon the insurance companies. Nearly all the large city depots are insured in the great insurance companies. So great is the risk considered by the companies that no one will write the whole of the risk, but the matter is usually adjusted by a great number. Thus, in the Hoboken fire more than half a dozen large companies carried the risk.

The insurance companies which carry the risks for the large railroads are divided into two large sections commonly known as the "Eastern Syndicate" and the "Western Syndicate." The insurance companies composing these two syndicates are the strongest in the country, and adjustments are made according to the risks of the property. In the past the companies have not been so severe in their rules regarding railroad property, but in the past year or two so many fires have made the insurance inspectors more critical. The railroad sheds, roundhouses and other buildings in the yards of a large line are usually constructed of structural steel and corrugated iron sheathing. There is not a great amount of combustible material stored in any of these buildings, but when a fire breaks out and destroys the wooden cars temporarily stored in the yards the destruction is widespread and disastrous. The destruction of a large terminal yard and depot by fire always means losses mounting up to hundreds of thousands of dollars. There is hardly enough insurance to go around among the different railroad companies to make all of their stations and rolling stock safe against fires.

The insurance which the companies assume themselves is therefore one of the protective methods that have been forced upon them. The "blanket insurance" is placed upon the railroad property, including rolling stock, car sheds, depots and freight houses. A fund is set aside each year for this insurance. This is equal to the premiums that would be asked by insurance companies to cover the risk. This "blanket insurance" is applied more particularly to such property which the large insurance companies will not insure except at high premiums. A good many railroads do not carry insurance outside of their special fund on their general equipments. There is a pooling system among the railroads which makes it compulsory for the company to pay out of their insurance fund for any cars or rolling stock belonging to the other companies when destroyed by fire on their particular tracks. Thus, in the Lackawanna fire, this railroad had to pay for all the freight and other cars belonging to the Trunk lines which happened to be caught in the great terminal conflagration.

Nearly all of the large railroad companies employ a superintendent of insurance, who looks after the small scattered risks on the line, and also attends to the placing of risks in regular insurance companies. Such an officer is supposed to keep down the risks in any particular part of the system. If there is a congestion of freight cars loaded with goods in some dangerous terminal where a fire might destroy immense amounts of private property, the insurance superintendent readjusts the risks so as to cover at least a part of this property. In the great freight terminals the danger is in some respects greater than in the passenger depot. Great quantities of combustible goods, such as hay, cotton and oil, may be stored in one of the mammoth freight yards, and a fire breaking out there would prove difficult to control. Thus the New York Central a dozen years ago lost nearly three millions of dollars' worth of rolling stock and property by a fire in their yards on the North River. The railroad sheds, warehouses and piers were swept almost completely away, and the company had to rebuild from the foundation up.

In view of these complicated risks a railroad company of any considerable size must look upon the fireproof and insurance questions with no little anxiety. Those which depend entirely upon the fire insurance companies for carrying their risks do not generally have more than half their property insured. The tendency has been to build steel and iron freight and passenger cars on the leading roads to eliminate as far as possible the fire and accident risks, and it may not be many years before most of the rolling stock of the country will contain very little wood indeed. The pressed steel cars are being manufactured as fast as the companies can turn them out, and very few new orders are being placed for the old-fashioned wooden cars.

But the construction of terminal stations, car sheds, switchyard buildings, roundhouses, ferry houses and slips, and the scores of other buildings essential to the traffic of a large railroad, is undergoing a revolution. The Pennsylvania's and New York Central's mammoth terminal depots in New York will undoubtedly represent the highest that can be achieved in modern fireproofing. So far as the plans are developed comparatively little wood will enter into their construction, but with concrete foundations, structural steel skeleton work, fireproof brick, tiles and terra cotta, they will be enduring and sufficient for all time. They are intended to combine the very latest in fireproof with the most ornamental and artistic. With capabilities great enough to accommodate traffic for the next half century, the need of surrounding the depots with every possible protective device has been emphasized upon the architects and engineers. When it is remembered that this operating power is to be electricity, the need of absolutely fireproof material in the buildings and subway connections is even more imperative. Neither cars, tunnels nor buildings will contain enough inflammable or combustible material to feed a small fire started by short-circuiting.

The period of wasteful expenditure in railroad terminals in New York has apparently passed, and even those whose depots are across the river at Hoboken or Jersey City will in the future be made to conform to modern ideas of fireproof construction. It is for this reason that a great fire like the Lackawanna is not without a certain lesson for good. It may prove rather costly experience both to the railroads and the insurance companies, but progress is sometimes made in no other way. Not until the railroad terminals both at the river's front and in the heart of the city are built according to the latest fireproof designs will railroad property be even moderately safe against fires from within and from without.

GEORGE E. WALSH.

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FOR SAFETY

FIREPROOF MAGAZINE

DEVOTED TO METHODS OF SAVING LIFE AND PROPERTY

INTERESTING AND VALUABLE TO EVERY ARCHITECT AND INVESTOR IN BUILDINGS

THE TIMES BUILDING, NEW YORK.
C. L. W. Eidlitz, Architect.

FIRE LOSSES ARE A TAX UPON THE NATION: A TAX THAT CAN BE LARGELY REDUCED

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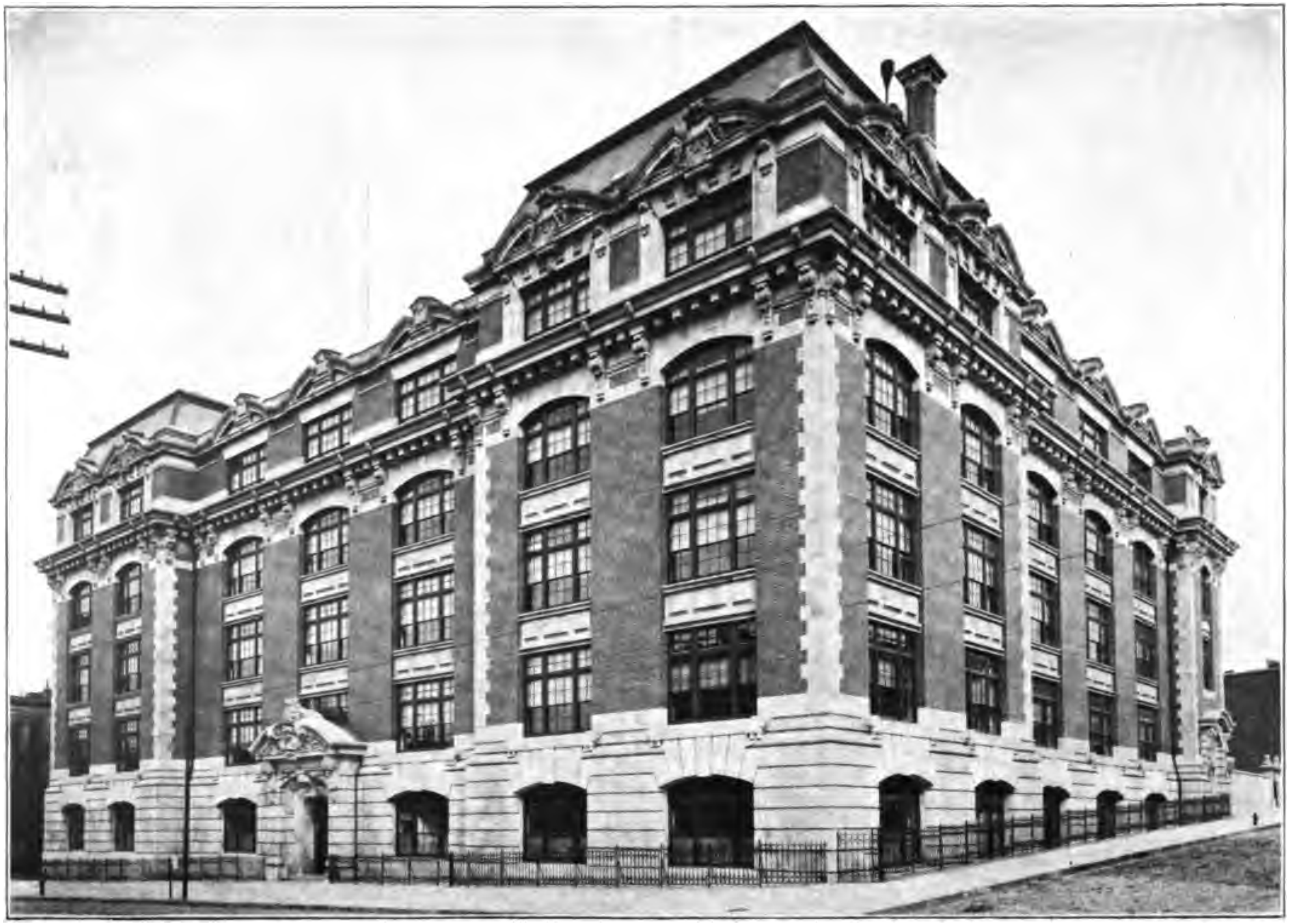

MANUAL TRAINING HIGH SCHOOL, BOROUGH OF BROOKLYN, NEW YORK CITY—FIRE PROOFED WITH TERRA COTTA.
C. B. J. Snyder, Architect to the Board of Education.

FIREPROOF MAGAZINE

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CONCRETE FIREPROOFING SYSTEMS

A DESCRIPTION will be found elsewhere in this issue of a warehouse in which not only the fireproofing system but the complete construction is of reinforced concrete. Because it may appear to some that this is a new departure on our part, we take this occasion to state—although it may not be necessary in the case of our constant readers—that the introduction of this description is only an illustration of the attitude which we have consistently assumed with reference to the use of concrete as a fire-resisting material. This can be seen in numerous articles which have appeared, together with extracts from papers written by those who have the right to be regarded as unprejudiced authorities upon the use of concrete, ever since the publication of the article which appeared September, 1904 (page 46), on "Concrete as a Constructive Building Material." In that article the origin of the whole system of reinforced concrete as now practiced was described, fixing its date at 1875 and 1877. Since that time no material advance has been made in applying this system to the construction of buildings, though a vast amount of experimentation and writing have brought it prominently before the public, and a large amount of all sorts of concrete work has been done. The article above referred to has been followed by numerous others, both original and selected, which have been intended to give the best information on the subject.

It should be remembered as a matter of history that the first attempts to introduce plastic systems of floor construction in which tension materials were introduced, since the work of Ward and Hyatt, were made only about fifteen years ago. In these systems lime mortar gauged with plaster-of-Paris were used with cinders and sometimes with gravel. The motive behind their use was originally to make a market for patented tension materials of steel. The precedent for the use of plaster was found in the Paris systems which had long been used with iron bars for tension and reinforcement. Gradually lime and plaster went out of use, as their total unreliability became evident. Only short spans and steel I-beams had thus far been used. The reduction in the cost of Portland cement, through its increased manufacture in this country, aided in its substitution for plaster, and offset to a certain extent the saving of labor in the use of plaster through the quick setting properties of the latter, and thus the cement industry became interested. But cinders, as a dilutent, continued to be used.

Then the great hardening property of Portland cement led to the adoption of very long spans between beams, and in some cases the spanning of whole rooms between girders with reinforced floors. But others came into the business who refused to use cinders and employed only sand, gravel and crushed stone as dilutents, and ever since then there has been competition between these and those who persist in using cinders.

The use of hard concrete of the best quality, with its resistance to compression, naturally led to the invention of reinforced concrete beams, girders and piers, which latter, in order to demonstrate that this system was in competition with steel in all its forms, were called columns. The battle is still going on between the cinders men and the hard concrete men, with many advocates for both; but it is only shown in the competition for contracts in architects' offices. The engineering journals which give so much space to reinforced concrete say nothing about it. The only part this magazine has taken in the contest has been to condemn the use of cinders in all kinds of concrete in unmeasured terms, and it is the only journal that has consistently done so. It has therefore published the opinions of various experts who have not failed to speak boldly on the subject, and whose words have been printed without special indorsement in other technical journals. We have never intentionally condemned first-class reinforced hard concrete as a fire-resisting and constructive building material, though a great deal of it has been the subject of merited criticism. But we have claimed only that it is inferior to burned fire clay. The many failures of reinforced concrete that have been illustrated in these pages have not all been of the cinders variety. They have shown that defective workmanship and carelessness are common to both. When others occur we will endeavor to continue recording them truthfully. One appears in the present number. It happens to have been a cinders job.

The article first referred to (see page 192) is a description by a competent writer, who has given much study to the subject of fire prevention, of what is probably as good as any other fire-resisting building of reinforced concrete throughout that can be found in this country. It also represents the most advanced practice in absolute incombustibility. It tells the story of how a sober second thought prevented the erection of another "slow burning" monstrosity. It will be seen that after abandoning the idea of mill construction the owners were able under the building law to make the building higher. But its height is the practicable limit for hard concrete buildings for warehouse purposes.

This fact opens another question as between hollow tile fireproofing and concrete. There is no doubt but that the reduced weight of steel and hollow tile construction in this case would have made a ten-story building equally practicable and very little more expensive than an eight-story building as erected.

Moreover, we do not believe it would be any more expensive to duplicate it, as erected, with steel and hollow tile construction and a brick exterior. Semi-porous terra cotta as now made will not only go through a conflagration without cracking from unequal expansion, but without any chemical change, while concrete is affected permanently by heating and cooling, even though it remains in position after the fire. Still the Gair warehouse is an illustration of one of the best results that fireproofing with concrete has yet attained.

FIRE RESISTING VALUES OF HOLLOW TILE AND CONCRETE

Attention is called to an account in other pages of this issue of tests made at the Underwriters' Laboratories in Chicago of the effects of fire on different concretes used with steel reinforcement. These tests are not as complete as we hope others will be, if undertaken at the new testing station just completed. But they serve to make good what we have often claimed, that concrete for fireproofing is affected in a very different manner than is burned clay, and that the framers of our building ordinances are justified in giving it second place. It is an undisputed fact that burned clay which has been manufactured at a temperature of 2,500 degrees F. is not structurally or chemically affected in ordinary building fires or conflagrations. The only failure of burned clay tiles that has been recorded is cracking due to unequal expansion. This was seen in much of the thin hollow tile exposed in the Baltimore conflagration. But the manufacture of semi-porous hollow tile with thick walls has obviated this defect. The tests made by the British Fire Prevention Committee proved this, for though exposed to a heat during four hours which rose to 1,800 degrees F., semi-porous tiles were unaffected in any way. It is easy to see that concrete would have been changed in its organic structure after such a test, even though it might have remained in place. In this difference lies the great question of salvage, which is of more interest to fire underwriters than any others who have to do with fireproof construction.

IMPORTANCE OF UNIFORM BUILDING ORDINANCES

Following the publication of extracts from the new building ordinances of Cleveland and Chicago, so far as concerns the erection of fireproof buildings, we commence in this issue the republication of the recommendations of the National Board of Fire Underwriters as to what should constitute a general building ordinance so far as concerns fire prevention. The International Association of Building Commissioners and Inspectors has already issued its recommendations as to the proper provisions of all building laws, and has urged the use of the Cleveland ordinance as a model. Its influence in all cities which have organized building departments has already been felt. But the recommendations of the National Board, if the numerous insurance agencies in cities which have no building department should show any interest or activity in their promulgation, will undoubtedly be more far-reaching than those of the other body. Fortunately there is very little inconsistency in the two sets of recommendations. The National Board has profited from a study of the Cleveland law, just as has the committee which framed the new Chicago ordinance. Altogether there is now no lack of light on the subject, and for all who desire to study it in convenient form the files of FIREPROOF MAGAZINE will prove to be useful. This is only a part of the educational work we are trying to do.

This reminds us that we are still waiting to hear the results of the commission which has been trying for more than a year past to evolve a building ordinance for the city of Baltimore. Latest reports were that the commission had been obliged to take a steamboat voyage on Chesapeake Bay in order to keep together and concentrate their thoughts upon the subject.

Meanwhile the Baltimore newspapers report the burned district three-quarters rebuilt, one and a half years after the conflagration. Is the commission waiting until the other quarter is built before making its report?

A REMARKABLE CASE AT LYNCHBURG

If the "sober second thought" which resulted in changing the Gair warehouse at Brooklyn from mill construction to concrete is a good illustration of the progressive thought of the time on the value of fireproof building, certainly the transformation which took place at Lynchburg, as described by Mr. Bertolett on other pages, was a greater one. The remarkable part of it is that the owner thoroughly believed in the old adage that "it is never too late to mend." He even made a sacrifice of a large amount of wooden floor joists which had already been set in his building for the sake of having it fireproof. These probably had little value when taken out. We give him full credit for these good motives, as we know of no others that induced him to transform his new building into one of permanent value and an example to all his neighbors. We would like to know what was the percentage of the extra cost of the completed building over what is would have cost had it been completed as commenced. We would also like to know what was the value of the sacrifice he made.

TESTING HOLLOW TILE PARTITIONS IN ENGLAND

The proprietors of the *Builders' Journal* (London) have recently made some interesting tests of the strength of hollow burnt clay tile partitions. The partitions and column coverings now being used in the Ritz Hotel are of American manufacture, and were shipped from New York by the National Fireproofing Company. Numerous other kinds of so-called fireproof partitions have been used in England and several of them have been tested for fire and water by the British Fire Prevention Committee, with varying results. But burnt clay hollow partitions are still a novelty there, though more universally used than any other materials for fireproof partitions in this country. It seems, however, that the Hempstead Patent Brick Company of Hemel Hempstead, Herts, has recently gone into their manufacture. The *Builders' Journal* being unaware of their great strength, has therefore instituted these tests. A partition was built eleven feet long attached to walls at both ends and ten feet high, supporting a floor of which the full weight of seven and a half feet per lineal foot fell on the partition. The lower half of the partition was built of blocks 12 inches long, 9 inches high and 2½ inches thick; the upper part was of blocks 12 inches long, 6 inches high and 2½ inches thick. The blocks were set on the long sides and hence were subjected to side pressure. The thickness of the shells was ¾ inch. The blocks in the upper half were plastered with one thin coat on both sides. The setting mortar was made of

Portland cement and crushed bricks, 1 to 3, and no sand. The partition weighed 35 pounds per superficial foot. It was loaded with 640 pounds per superficial foot of floor, which appears to have been 4,820 pounds per lineal foot of wall. This was ten times the prospective load and it seems to have been a surprise to those making the test that the wall was so strong. This test, published in the *Builders' Journal* for September 27, will probably give a great impetus to the use of hollow clay tile partition blocks in England.

BRITISH FIRE PREVENTION COMMITTEE'S TESTS

The latest bulletins of the British Fire Prevention Committee (Nos. 95 and 97) contain reports on tests of wired glass. Tests were made on three vertical openings and four horizontal ones all filled with this material. The glass was of the manufacture of Messrs. Pilkington Bros., Limited, of St. Louis and London, and the test was of three-quarters of an hour duration, the temperature not to exceed 1,650 degrees F. to keep it within the melting point of glass. This temperature for such a test is perfectly fair, because wired glass is a retardant and not a fireproof material, the virtue of which is that the wires will hold the glass in position up to the melting point. This was proved in both tests. Various kinds of frames were used, but the metal ones were all made of rolled forms of steel and not of hollow sheet iron, as is the practice in this country. Some of the frames were of teakwood, and in some cases the glass was fastened into brick jambs. The glass held its place in all the tests, and the results were all that had been anticipated.

The successful tests made last year at the Underwriters' Laboratories in Chicago of several kinds of hollow metallic window frames and sashes set with Mississippi wired glass, taken in connection with those above described, may safely lead to the conclusion that wired glass has now been established as a fire retardant of the greatest value in temperatures up to its melting point.

The next improvement to be sought by those interested will now be to find a glass with a higher melting point.

GOOD NEWS FROM ATLANTIC CITY

The enthusiastic editor of the *Atlantic City Gazette*, to whom we referred in our September issue, must be congratulated on the realization of at least part of his prediction of the monopoly in fireproof hotels which he promised to that enterprising seaside resort. For another new fireproof hotel is rising there in all its beauty and substantiality. This building is being erected for the Annex Company and adjoins the Marlborough Hotel on the boardwalk. A cotemporary gives the following description of it:

> "The new building, which is being put up by the National Fireproofing Company, will make a new record for quick construction. On June 17 the big block of ground on which this building is being reared was absolutely vacant. On November 1 the completed structure, containing 250 rooms, and rising to a height of six floors throughout and to nine floors in a central dome, will be turned over to its owners ready for decoration and furnishing. Completely equipped, the hotel will open its doors on February 1.
>
> "Stretching 425 feet back of the boardwalk, this new building varies from 50 to 125 feet in width at different points. One of its features will be a great sun parlor extending around the front part of the building on the second floor. This sun parlor will have an outlook up and down the boardwalk. It will be twenty-

five feet wide, and will contain six fireplaces of unique design, thus making the parlor particularly attractive in winter. There will also be a sun parlor stretching entirely along one side of the building. In fact, the entire story will be enclosed only with glass on one side.

"The structural part of the building is composed largely of hollow tile reinforced by a special steel bar. There are no large steel girders or beams in the structure. The outer walls are to be of hollow tile, with pebble-dashed exterior finish. The use of hollow tile building blocks and fireproofing in this wholesale manner marks a distinct departure in building methods."

IT REALLY WAS FIREPROOF

It is really refreshing to read accounts in the daily newspapers of fires in which any credit is given to the fireproof qualities of buildings. It was formerly the custom to say, after giving a very exaggerated account of the fire and consequent panic, with all its startling incidents, hairbreadth escapes and heroic deeds, that "the building was said to be fireproof." Certainly the daily press is beginning to be abreast of the times or else some reporter with an unusual amount of brains has got a job. Here is an account from the Brooklyn (N. Y.) *Eagle* of a fire which occurred in that city:

"Shortly after 7 o'clock this morning flames, caused by defective insulation of an electric light wire, broke out on the eighth floor of the ten-story building, 129 to 135 Charlton street, Manhattan, occupied by Heywood Bros. & Wakefield Company, furniture and baby carriage manufacturers. This floor is devoted to the upholstery department, and was filled with excelsior, upholstery cloths and other inflammable materials, and before the fifty or sixty men employed on it could make much of an effort to check the fire flames had filled the entire floor.

"Fortunately, the building is fireproof and the firemen had little difficulty in confining the blaze to the floor in which it started. Two fireboats which responded to the alarm found that their services were not needed. So sure were the several hundred men employed in the building of its fireproof qualities that there was no panic, although the fire, as far as the eighth floor was concerned, was more or less spectacular. Manager Walsh estimated the damage at $15,000."

FOR OUR DECEMBER NUMBER

The December issue of FIREPROOF MAGAZINE will contain a fully illustrated description of the new home and testing plant of the UNDERWRITERS' LABORATORIES, at 382 Ohio street, conducted under the direction of the National Board of Fire Underwriters. This building is another illustration of a sudden change of mind on the part of those who ought to be the first to see the error of their ways. For it was originally planned to be erected according to the tenets of the advocates of mill construction, with wooden floors. When the board decided to abandon that system under the advice of Mr. E. V. Johnson of Chicago, and the approval of its architect Mr. Argyle E. Robinson, it concluded to make the building a model of fireproof and incombustible construction. With this in view it adopted improvements which are in advance of anything that has been done anywhere. The exterior is of brick and the interior is steel and tile. But this does not mean that it is like numerous other buildings which have been described in these pages. The material used is semi-porous terra-cotta, with smooth surface, and all joints pointed with cement, and there is no plastering in the building. The Johnson system of tile construction, with steel tension for floors, is used; but underneath all the tension materials the ceilings are formed with two-inch porous terra-cotta tiles. All the inside finish is metal and thirteen different makes of hollow sheet metal window frames, sashes and skylights, glazed with Mississippi wired glass, have been introduced as exhibits after testing.

THE NEW SIEGEL DEPARTMENT STORE, BOSTON

BY J. K. FREITAG.

THE new department store of The Henry Siegel Company, opened to the public in Boston on September 11, forms a somewhat notable addition to the list of really modern and fire-resisting structures devoted to mercantile purposes.

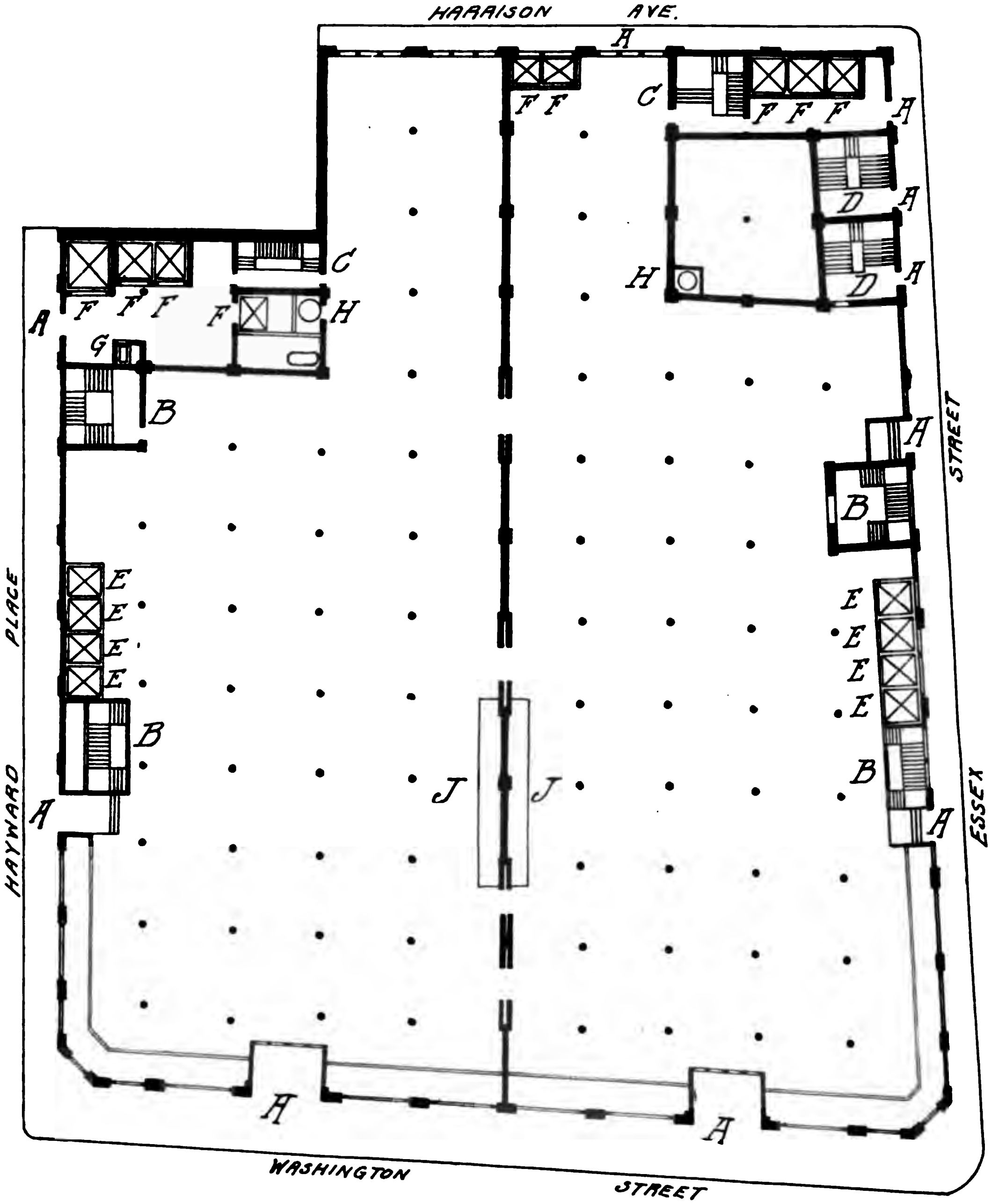
It is interesting to investors in real estate as demonstrating the fact that one of the largest and best-known firms in the department store business in this country has so shown its faith in the value and expediency of thorough fire-resisting construction as to warrant paying an annual rental value for a long term of years, based upon a percentage of the cost of a building, which was designed and erected in strict accordance with the ideas and requirements of the lessees. Needless to say, the very best of fireproof construction would not have been insisted on if a cheaper or less efficient construction had been deemed wise. But public opinion, and the advantages of advertising a thoroughly fireproof building for the use of its patrons, to say nothing of added security to stock and business and more advantageous insurance rates upon a large and valuable stock, much more than compensated any possible increase in the cost of the investment.

This building is also of considerable interest to architects and those concerned with fire-resisting construction in regard to the special act under which it was built, and in regard to certain commendable features which were incorporated in the design. Probably no building, in the City of Boston at least, and Boston must certainly be classed as among our most conservative cities in regard to building and insurance regulations, has been built under as careful supervision of fire underwriters and under as thorough inspection by the building department as has the Siegel store.

The building covers the entire block bounded by Washington street on the front, Harrison avenue on the rear, and Essex street and Hayward place on the sides, save a small corner at the rear of Hayward place which the lessee declined to surrender at a reasonable figure. The frontage is about 200 feet, and the depth about 250 feet, thus making a total block area of some 50,000 square feet.

The present building laws of the City of Boston were originally based upon a law recommended by the Mayor, the members of a special commission appointed for that purpose, and officers of the Boston Board of Fire Underwriters. These laws were passed by act of legislature in 1892, since which time various amendments have been added. The requirements governing the erection of mercantile buildings contained, among other stipulations, the following: "And all such buildings hereafter erected which are used above the first floor as warehouses or stores for the storage or sale of merchandise shall not exceed one hundred feet in height, and shall be so divided by brick partition walls of the thickness prescribed for bearing partition walls, and carried thirty inches above the roof, *that no space inside any such building shall exceed in area 10,000 square feet.*"

The effect of this law upon new retail or department store buildings can readily be seen. Thus in the present instance, after deducting from the total block area the unavailable corner, and all necessary space for



THE SIEGEL DEPARTMENT STORE, BOSTON.
Winslow & Bigelow, Architects.
First Floor Plan:

A A—Entrances.
B B—Public stairs.
C C—Fire stairs.
D D—Employes' stairs.
E E—Passenger elevators.
F F—Freight elevators.
G—Waste paper shaft.
H H—Package chutes.
J J—Escalators.

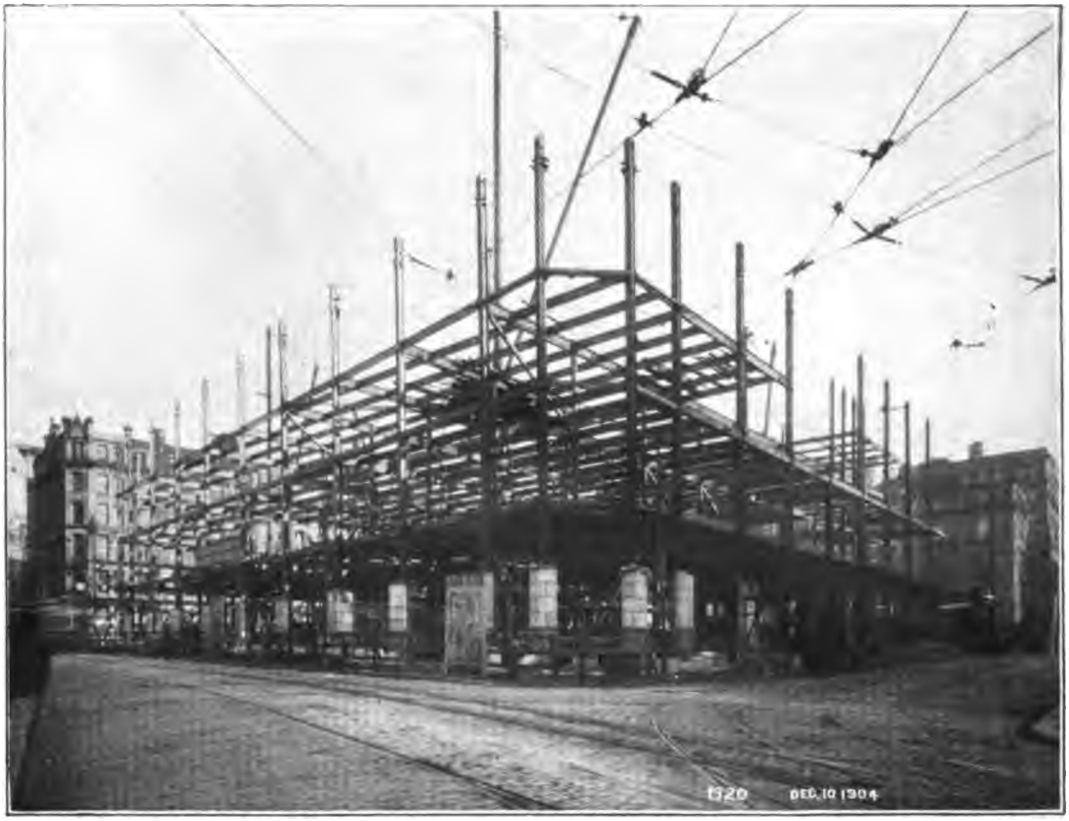
enclosed stairs, offices, hallways, etc., some 40,000 square feet of floor area for available selling space still remained. If, then, the maximum permissible undivided area of 10,000 square feet were adhered to, the result would mean practically four separate stores, each of a width of about 50 feet on the front by some 200 available feet deep. For as Washington street is one of the main shopping thoroughfares of the city, it would be necessary, or at least advisable, to have all principal entrances from that direction, and indeed the first sketches made for the structure contemplated four such deep and narrow sub-divisions, necessarily dark, unattractive, and wholly unsuited to the advantageous uses of a large departmental store. The proposed lessees and the "Department Store Trust" who stood ready to build the building under suitable conditions, therefore sought remedy in special legislation.

It may be that some fire protectionists will take issue on the advisability of such a step, and, indeed, some did take issue upon the proposed amendments to the existing law; but, in spite of all arguments which favor restriction of areas in mercantile buildings on the grounds of greater accessibility for the fire departments, less intensity of fire and consequently less structural damage, and less danger of communication of fire from the originating location, it is an open question whether properly regulated large areas under special conditions are not more advisable than the restrictions caused by such a limitation of store areas upon trade and enterprise, which constitute valuable assets to a large city.

The pros and cons of the subject were fully discussed in connection with the proposed relief to those most vitally interested in the Siegel building, and the result was the passage by the state legislature on May 23, 1904, of the following act which amended Section 23 of the then existing ordinance relating to first-class mercantile buildings.

"A first-class building shall consist of non-inflammable material throughout, with floors constructed of iron or steel beams filled in between with terra cotta, or other masonry arches, except that wood may be used for under and upper floors, window and door frames, sashes, doors, standing finish, hand rails for stairs, necessary sleepers bedded in concrete, and for isolated furring blocks bedded in plaster. There shall be no air-space between the top of any floor arches and the floor boarding, and no air-space behind any woodwork. And all such buildings hereafter erected which are used above the first floor as warehouses or stores or for the storage or sale of merchandise shall not exceed one hundred feet in height, and shall be so divided by brick partition walls of the thickness prescribed for bearing partition walls, and carried thirty inches above the roof, that no space inside any such building shall exceed in area ten thousand square feet, except that when any such building has a frontage of not less than fifty feet on each of two streets, such space may amount to but shall not exceed twenty thousand square feet in area; provided, that buildings in which such extension of area beyond ten thousand square feet is permitted shall have, in a manner to meet the approval of a board consisting of the fire commissioner, the building commissioner and a representative of the fire insurance interests of Boston, who shall annually be appointed by the Mayor, properly installed systems of automatic sprinklers, all vertical openings through floors protected by fireproof enclosures, and satisfactory means of ingress and egress. In buildings thus protected there may be communicating openings through such partition walls to the number of one for each fifty linear feet of wall on each floor, each opening not to exceed eight feet in width and ten feet in height, with brick curtain wall above of at least three feet; all such openings to be protected by double standard fire doors."

The special board required by this act of



THE SIEGEL DEPARTMENT STORE, BOSTON.
Condition of building December 10, 1904.

legislature was composed, as specified in the act of Mr. James Mulcahy, building commissioner of the city of Boston; Mr. Henry S. Russell, fire commissioner and since deceased, and Mr. Osborne Howes, secretary of the Boston Board of Fire Underwriters, and after a careful examination of the architects' plans, this board ordered the owners of the Siegel building to comply with the following requirements:

First. All vertical openings through floors, enclosed in shafts of brick, terra cotta or metal studs and metal laths plastered on both sides, to have self-closing metal covered doors, hung to metal frames with metal thresholds.

Second. Automatic sprinkler equipment according to the latest insurance requirements, to be supplied by high service connections, and, as a secondary supply, by three 4,500-gallon steel pressure tanks placed on the roof of the building at a central point. The discharge outlets from these three tanks (each with gate and swing check valves) to be connected together and to a 6-inch drop, carried down to the basement, and connected into the piping from the city supply above referred to. This provides a supply main in the basement having two independent constant supplies at all times.

Third. Stairway and escalator enclosures to be also protected by sprinklers, as well as all show-windows, offices, closets, etc.

Fourth. Building to be provided with outside iron balconies, 3 feet 6 inches wide, at the several floors and connecting the sections on each side of the dividing brick wall with ladders connecting the several balconies, to enable the fire department to reach the hose connections on the standpipes.

Fifth. Four-inch stand-pipes on the Washington street and Harrison avenue fronts, to extend from the sidewalk up to the top story, through the balconies, with two standard fire department connections at sidewalk level, and with branches provided with 75 feet of hose connected thereto on either side of the brick partition on each floor.

Sixth. All grille work enclosing elevator shafts to be arranged so as to prevent completely the passage of smoke or fire.

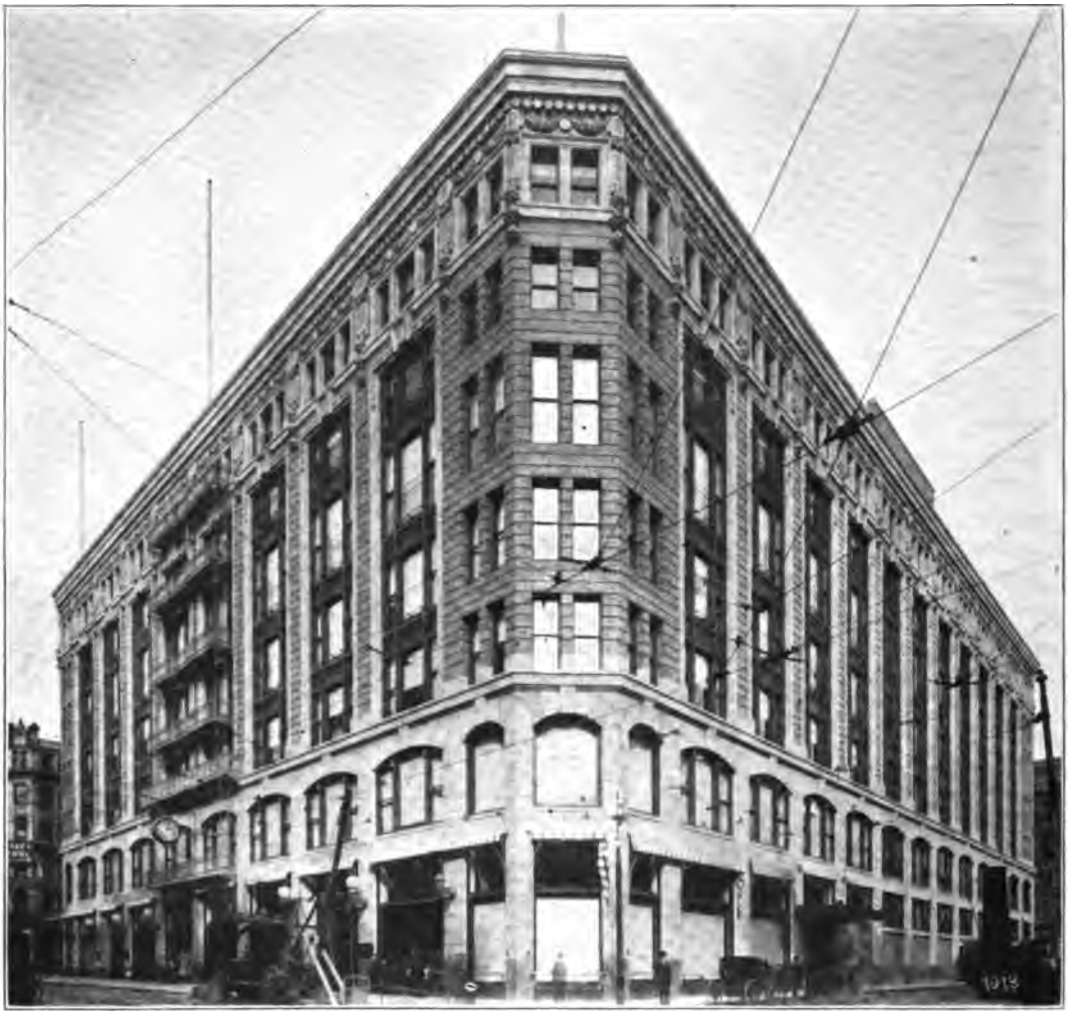
These special requirements, added to the constructive features called for by the city building laws, resulted in a particularly meritorious structure, considering its size and character, and it is doubtful whether anything more in the line of advanced fire-resisting construction has so far been attempted or attained, unless it be in wholesale warehouse design, for storage purposes only.

There is nothing especially noteworthy in the main structural features. Suffice it to say that the walls are of brick with terra cotta trimmings, on a base course of granite. The metal framework of the building is of steel beams, some 3,500 tons in weight, and something over 1,400 tons of circular cast-iron columns. The large area of the building and the comparatively low height of seven stories did not call for any special provision against wind pressure, hence the use of cast-iron columns was entirely justifiable from economic considerations.

The fireproofing material, consisting of floor-arches, column and girder protections and furring blocks, is entirely of semi-porous terra cotta. The floor-arches are 15-inch flat side-construction semi-porous terra cotta for all floors except the seventh floor and roof, which on account of the top story being used for storage purposes only, are made of segmental arches.

The most important elements of fire-resisting construction, viz., suitable materials, are thus provided in the ground-work of brick and terra cotta; but it is in the added safeguards which have been provided, and in the careful attention bestowed upon all details of construction, that the fire protectionist's chief interest centers. Not only have the city building ordinances been carefully followed as to requirements for isolated fire stairs, fire doors and satisfactory means of ingress and egress, etc; and not only have the instructions of the special board been complied with; but even additional precautions have been provided by the owners beyond all that might be required of them. Thus, in the matter of sprinklers, all openings in exterior walls, except those metal and wire glass windows over the property at one corner, around which the new building was built, are provided with sprinkler heads which, in case of any severe exposure fire, will either wholly or largely prevent the communication of fire from any adjacent structure.

The passenger elevators are located in two nests of four elevators each at the side exterior walls. The shafts are therefore well lighted from windows opening directly into them, and in order to allow the freest possible passage of light to the store room beyond, and also to fulfil the requirements of the boards as to vertical openings, wire glass was naturally selected as the best, or in fact, the only material possessing the necessary qualities of transparency and fire-resistance. The enclosures therefore consist of ornamental cast-iron pilasters, cornices and transom-bars, filled in with polished plate wire glass, set in iron muntins. The doors are of cast-iron ornamented lower panels, with wire glass above. It will also be remembered that these enclosures were also required to be smoke-proof as far as possible. Hence the iron framework was so arranged and detailed as to provide "rebates" or stop bars at all joints and laps, the doors fitting into pockets made in the pilasters, while all transom and panel joints were also made perfectly tight. To facilitate the rapid handling of crowds of people a threefold type of door was specified, thus



THE SIEGEL DEPARTMENT STORE, BOSTON.
Winslow & Bigelow, Architects.

providing an available two-thirds opening for emptying and filling the cars.

In one of the large rear hallways, and very near the larger freight elevators where most cases, etc., are likely to be unpacked, has been constructed a brick shaft running from the sub-basement to roof, in which, at each floor, is placed a paper-chute box. This is made of iron, built into the brickwork, consisting of an inner counterbalanced dumping door or bottom, which can only be dumped to discharge the contents down the shaft *after* the outer or wall door has been tightly closed. The possibility of communication of fire from shaft to room, or from one floor to another, is therefore positively prevented. A large fireproof paper storage room and a special crematory for consuming all such rubbish is located in the sub-basement.

The building is also provided with moving stairways or escalators on either side of the central division wall, one set ascending and one set descending; with spiral package chutes for dropping all bundles or packages to packing tables in the basement.

The building was built by the George A. Fuller Company.

WHO IS TO BLAME FOR DESTRUCTIVE FIRES?

THE ARCHITECT'S OBLIGATION TO HIS CLIENT.

SAFETY should be the first consideration in building.

This is stated so often and accepted so universally as true that a re-statement of it sounds trite and commonplace.

Like many other excellent fundamental truths, however, it is usually recognized and passed by without further thought.

Sometimes it pays to think back to first principles and reconsider these old commonplace axioms.

There is not much comparison between the rude stone hut of our long-gone savage ancestors and the modern buildings which we are erecting to-day, yet the leading intent of each is the same—the securing of a place in which to protect from the elements our property and persons.

In both cases the prime consideration is exactly the same—protection from the elements.

This is as much the intention of every building of to-day, from the three-room cottage to the twenty story skyscraper, as it was of the aboriginal's cave.

We have largely overcome under present day conditions the dreaded elements of wind and water which our forefathers had to battle with. Modern science has done this for us.

Modern science in building has also, in a large degree, solved the question of immunity against the ravages of fire. The trouble is that not enough attention is paid to these methods of securing complete safety from fire.

The architect of to-day is human like the rest of us. He wants to make a reputation and he wants his work to make as great a show in the world as is possible.

The prospective building owner is also ambitious to have his property show somewhat in advance of that of his neighbor, and it is an undoubted fact that a great deal of the terrific amount of destruction by fire in this country can be and should be charged to this desire of the architect and building owner to make a show—"to cut a dash." It is probable that until our architects have educated themselves to the fallacy of sacrificing *safety* to *show* they will continue to labor under present conditions.

If by some psychological process the channels of thought of the architect and the building owner could be changed it is safe to say that in a very few years the terrible waste resulting from fire would be largely saved and the question eliminated from our national economics.

The materials, processes and methods are at hand (ready and clamoring for use) that make it possible to bring about an enormous reduction in our fire losses, but they are not used.

The burden of responsibility for this rests largely upon the architect. When he and the building owner are educated to the realization that it does not pay "to build to burn" these conditions will be overcome.

The appeal to the pocketbook is probably the only one that will produce the desired reform. The present procedure for a man, company or community wanting a building is to go to an architect and say: "We want a building for such a purpose to cost a stated sum."

The architect prepares his plans with the knowledge that it is going to be pleasing to his client, or the contrary, according to the show which he can make to the eye for the amount of money upon which he is permitted to base his estimates.

The owner has not educated himself upon the question of safety in building even to the point of knowing what he wants. We do not mean technical architectural education, but broad, commonsense ideas which a man should have in any enterprise he goes into and which he does have in almost everything except this "Building Question."

The architect is also a slave to the question of making a showing of beauty, grandeur, artistic merit and similar questions. If he says to the prospective building owner; "Why not have your building perfectly safe against fire as a first consideration?" the building owner either asks in reply: "What do I make by it?" or; "Can I save any insurance?"

Yet it is a question whether the owners of buildings in this country are not becoming more educated on this subject than are the architects.

They are learning from many channels that in building as in human nature, "beauty is only skin deep" and that to be a good investment a building must first be safe from danger.

They are learning this because they "pay the piper"—when damage and destruction ensue as a result of unsafe building methods.

These ideas are brought forth from a series of incidents which have recently come before our notice where buildings have been planned and contracted for and then the owners have awakened to the necessity for and demanded safe buildings even at an increase of the original investment.

At Springfield, Mass., a school building was recently planned and bid for by the contractors and the contract let for construction at $160,000. After arrangements had gone thus far the community asked: "Is this building to be fireproof?" They found that it was not and immediately raised a cry for fireproof construction. The plans were redrawn for fireproofing and the contractor, who now, of course, had things entirely in his own hands, stated that he would make a fireproof and safe building for $20,000 additional, an increase of 12½ per cent.

It would seem that in a school building in which over a thousand children were to spend the greater part of each day there could be no discussion as to the advantage of having a safe building, nevertheless, there was long and acrimonious discussion before the fireproof plan was finally adopted. The building has been erected, though it appears that it has a wooden instead of a fireproof roof.

In the city of Baltimore, which recently had such a disastrous fire, a new high school building was planned, bids were taken on it and the contract let at a figure of $311,000. Again the people asked for a safe building and the contractor, again with the matter in his own hands, put in a bid of $35,000 additional, an increase of 11 per cent. The authorities finally concluded to spend the additional money for a safe building and the appropriation was made.

The city solicitor, however, found certain legal technicalities in the way of this increased appropriation after the contract had been let and the City of Baltimore, in all its majesty, wanting a fireproof building to house hundreds of its children, willing to spend the money to have it and having the money to spend, are now striving to find some way whereby they can get what they want! The matter has not yet been settled.

At Ann Arbor, Mich., a high school building was planned to cost $250,000. Again the fireproof discussion arose under the same circumstances as in the two cases just cited, and an additional bid of $25,000 was made for a fireproof building, an increase of 10 per cent. After a referendum vote the citizens very foolishly, in our opinion, voted down the additional appropriation and apparently the strongest argument that they could bring forth in justification of their action was that their other school buildings were not fireproof and had not burned. A very similar attitude this to that of a man who says: "I sat in a draught yesterday and did not catch pneumonia and I will now sit in a draught to-day."

Furthermore this vote was taken in the face of the reports of a destructive fire in a Philadelphia high school, a splendid fireproof building with the exception of the roof and astronomical tower which were of wood and were destroyed by fire with great destruction of valuable property, but luckily no loss of lives. The fireproof portion of the building, that is the main structure, was safe and practically undamaged.

Now the authorities of Philadelphia are preparing to reconstruct a wooden roof and a wooden tower on the same building and the public is making a strong complaint against this decision.

Apropos of this discussion it is probably worth speaking of two press reports on the writer's desk (as this is being written). One deals with the destruction by fire at New Castle, Pa., of a large factory building, entailing a loss of $150,000, without any damage whatever to a fireproof building owned by the same company and exposed to the danger of the fire in the first building.

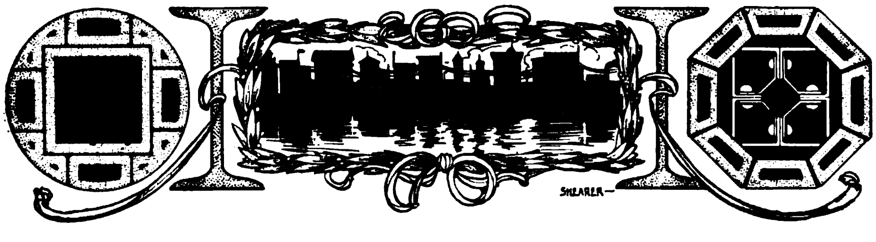
The other report is that of a fire in a ten-story fireproof building in New York devoted to manufacturing purposes and filled throughout with paints, varnish, woodenware and other combustible materials, in which a fire started on the eighth floor, sweeping that floor of its contents, with a loss of from only $10,000 to $15,000, and without damage to the building in any amount to speak of. The confidence of the employes in the building's perfect fireproof construction was so great that there was absolutely no panic and no loss of life.

Put against this the daily reports which we read in every edition of every newspaper of similar fires in buildings of combustible construction almost invariably destroying the entire building and contents, often accompanied by the loss of lives or injury to occupants.

Does this not demonstrate the obligation which the architect is under to his client to do something more in the preparation of his plans than merely to please the owner's eye?

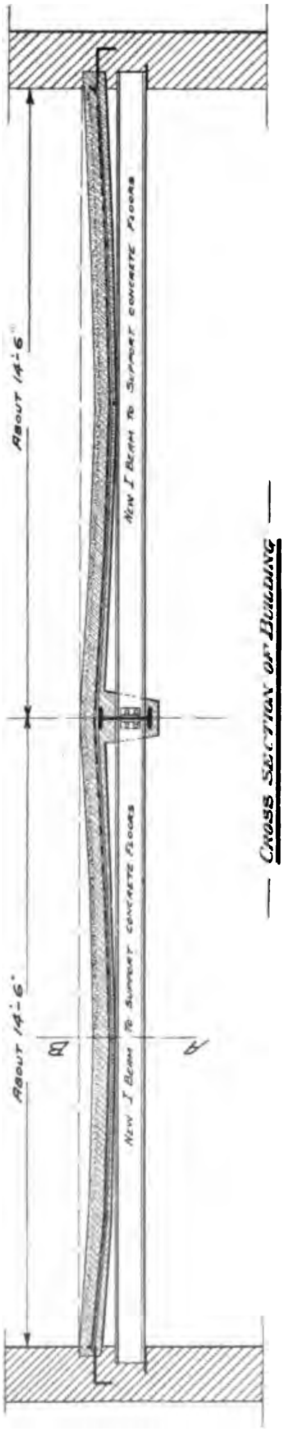
Is it not in a great measure the fault of our architects that so many buildings are continually going up only to be burned?

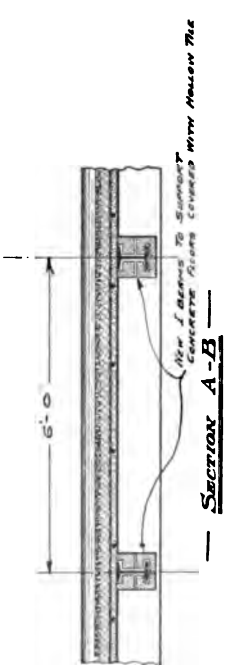
Any man of intelligence, architect or building owner, who gives a little study to this question of safe building is certain to realize the truth that it does not pay "to build to burn," and furthermore that there are direct financial rewards clearly to be traced as a result of safe fireproof construction.



A CINDERS CONCRETE FAILURE CORRECTED

THESE illustrations show what happened to the cinders concrete floors and roof of a storage warehouse recently mentioned in FIREPROOF MAGAZINE, which "happening" resulted in putting the building out of use for one entire season. They were built on the cable system and sagged from 2 to 4 inches. The owner was obliged to call in the experts of a contracting company which used only porous terra cotta hollow tiles for fireproofing and floor construction. But it was not found convenient to the owner to rebuild the floors and roof complete. The girders were sufficient for the purpose, so **I** beams were inserted between the girders and the walls six feet from centers and touching the sagged ceiling. These were fireproofed with porous terra cotta tiles. The floors were then leveled up with concrete. The effect of this was that the concrete slabs had bearings every six feet in the reverse way, instead of bearings 14 feet 6 inches apart, which were too wide for safe construction. The correction was made by the Illinois Terra Cotta Lumber Co. of Chicago.


About 14'-6"
About 14'-6"
New I Beam to support concrete floors
New I Beam to support concrete floors
A
B
CROSS SECTION OF BUILDING


New I Beams to support concrete floors covered with hollow tile
6'-0"
SECTION A-B

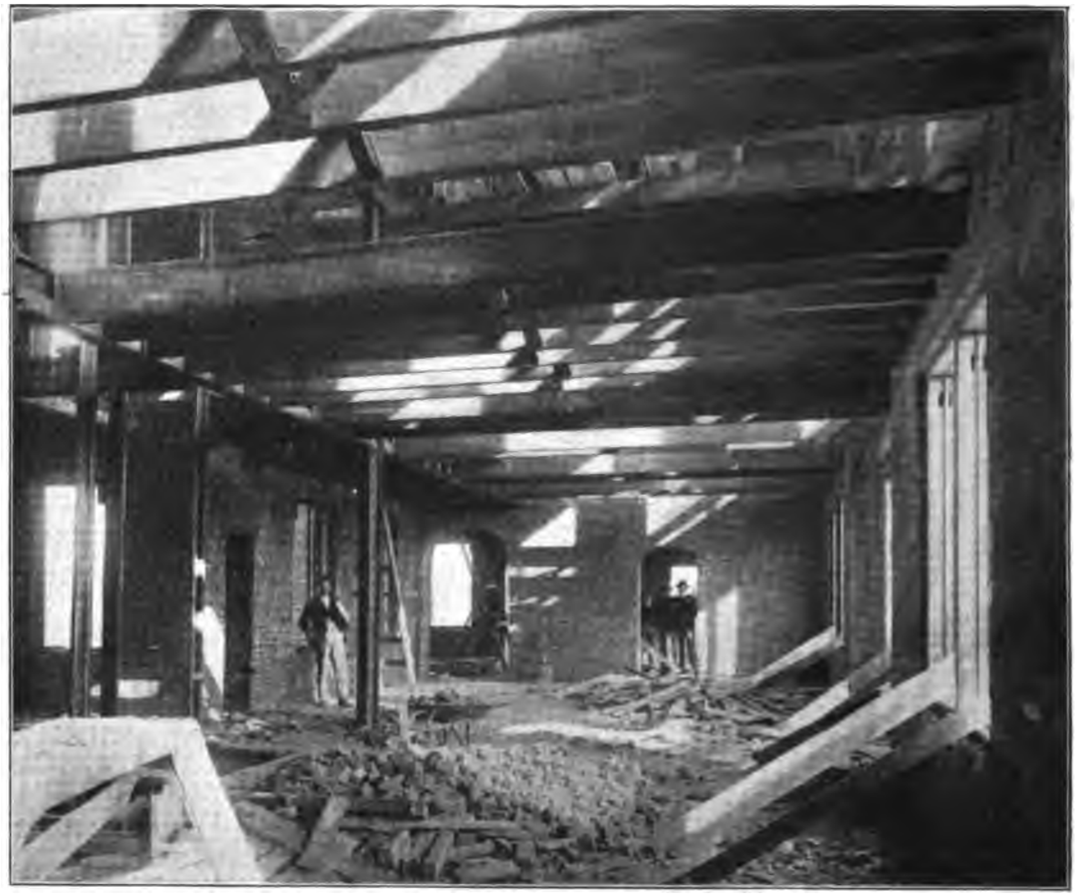
AN AWAKENING AND A TRANSFORMATION

BY EDWIN F. BERTOLLET.

OF all the results and products of human thought and industry there is nothing more thoroughly inconsistent in this epoch of the world's advancement than the beautiful stone, brick or terra cotta exterior of the vast majority of buildings constructed, when compared with the shrinking, doting, slowly decaying and easily destroyed interiors thereof. They are as the man without a character, the state without organization, or the firm without capital; they are as whitened sepulchers, full of dead men's bones; they are defiant of fate and conjurers of a swift destiny. As owners of such, we make a wager that their destruction is inevitable, and that sooner or later the time of our involuntary distress and eviction will come. Nature, from which man has taken most, if not all, his primary lessons in art and industry, affords us no precedent for so controvertible a creation as the self-destroying structures, making up the mass of improvements to real property, as we have been building in the past; but throughout natural conditions we find only that symmetry and consistency that is truly representative of the integrity and omniscience of the Great Architect, the designer and builder of the universe.

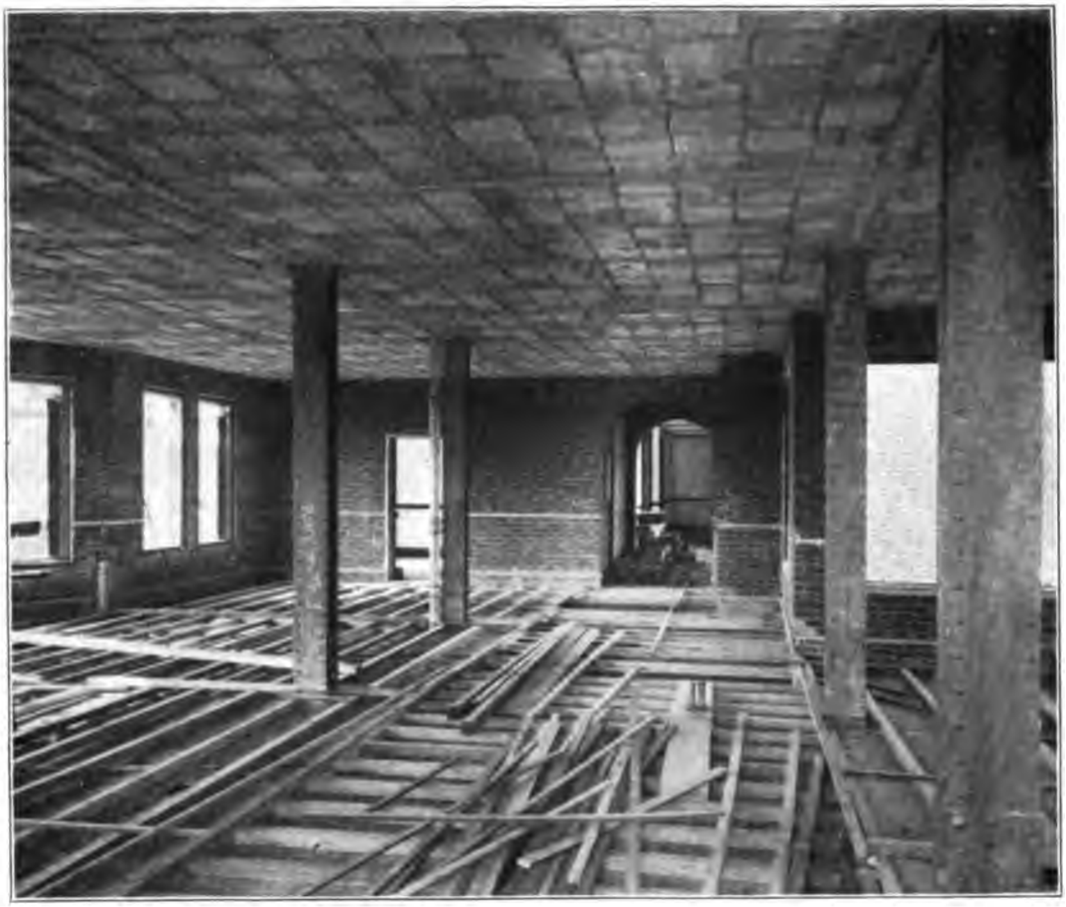
Man's privileges and obligations in connection with life and its environments are great and exalted, and each has his part in the divine commission of subduction and replenishment of the earth, and, humble though it may be, the rewards are not measured by mere amplitude of achievement, but by the spirit and fact, met in discharge thereof, and if he who has made two blades of grass to grow where one originally hibernated is a blessing and benefactor of mankind, is not he who adds to the permanency of real property not equally a benefactor of his race, in that he is a conservator of effort and force in a thousand senses? Has not the permanent good been promoted, the permanent wealth increased, the happiness and contentment of all been advanced by every consistent, permanent and indestructible structure erected, and has that man not ennobled his community who has had the courage to break from the common practices and place his work among the foremost defenses against the elements and invasions of decay? Such at least we feel to be tribute due to one

THE KRISE BUILDING AT TIME OF CHANGE FROM WOOD JOIST AND FLOOR CONSTRUCTION TO STEEL BEAMS AND HOLLOW TILE FIREPROOF CONSTRUCTION.



INTERIOR OF KRISE BUILDING BEFORE INTRODUCTION OF STEEL BEAMS AND HOLLOW TILE FLOOR CONSTRUCTION—WOODEN JOISTS STILL IN PLACE.

of the well-known and respected citizens of the city of Lynchburg, Va., Philip H. Krise. Mr. Krise projected and built a most complete modern office and banking building on one of the principal streets of the city named. It is a seven-story brick structure of pleasing proportions and satisfactory design, and, while somewhat more lofty than its neighbors, is entirely free from any suggestion of smartness or excessive modernity, is apparently perfectly at home among its more aged and modest neighbors, and would, had it been erected as originally projected with wooden floor, roof and stair and partitions systems, pass as a truly and wholly acceptable addition to the city's business houses. But to the owner's credit, we are to relate unusual facts, perhaps to state an isolated case; for the structure had been only placed under roof when Mr. Krise became impressed with the inconsistency and incongruity between wooden floor beams and the self-sustaining brick walls of the exterior. Conviction was followed by conversion and action. The wooden beams were removed—steel beams and follow tile floor systems installed in their place. Iron stairs and fireproof work in general supplanted wood interior work, and what was to have been the common class combustible structure is now a thoroughly substantial, practical and interesting fireproof office and banking building; a noble example to all future builders of the state; a permanent addition to the city and an honor to the man who has placed on the community a higher standard of honesty and integrity, as his building throughout is just what it



INTERIOR OF KRISE BUILDING AFTER INSTALLING THE STEEL BEAM AND HOLLOW TILE FLOOR SYSTEM THROUGHOUT ALL THE FLOORS.

seems to be from and on its exterior. Photo prints of the exterior, the original wooden joist system and the steel beam and fireproofed interior work are herewith shown and are a remarkable example of what may be accomplished toward making safe and permanent that which had been conceived along most commonplace lines.

OUR NEW YORK LETTER

REBUILDING MANHATTAN

New York, Oct. 2, 1905.

IT is not an exaggeration to say that New York City, and particularly the borough of Manhattan, is practically being rebuilt from the foundation up. Hundreds of millions of dollars are being invested in railroad tunnels and subways, and the whole system of transportation is being shifted and newly adjusted to improve conditions of trade and commerce. With adequate transportation promised for the near future, builders and contractors are entering into a movement to rebuild the city in a more substantial way than ever before. The most characteristic feature of the new building movement is the general fireproof quality of the structures and the almost universal effort to make them as permanent and durable as the art and science of man is capable.

For two years labor troubles have impeded the building progress of New York, but with the removal of these difficulties builders are carrying on work on an extensive scale. Approximately $125,000,000 are being invested in building operations this fall and winter, about $60,000,000 of which are for Manhattan, and the balance for the Bronx and Brooklyn. This enormous mass of construction is intended to meet a deficit in house accommodation and to anticipate the future for a year or two to come. It is estimated that this amount should accommodate upward of 200,000 inhabitants, but as 100,000 inhabitants are supposed to be added to New York's population annually the present plans will not far outrun the needs of the near future. It is furthermore generally assumed that from 10,000 to 15,000 are unhoused every year in Manhattan owing to the encroachments of business upon the residential sections, and that these houses are rebuilt for stores, offices or other business enterprises.

The rebuilding of Manhattan takes two distinct forms. One is the construction of entirely new fireproof buildings, and the other the rebuilding of old structures which a few years ago represented the highest science in fireproof construction, but which to-day are out of date. As an illustration of the extent to which the remodeling and rebuilding of some of these structures are carried on the new Plaza Hotel at Fifty-Ninth street and Fifth avenue is a fair example. In its day this hotel was one of the finest and most fashionable in the city, and it was entered as a fireproof structure on the records of the building department. But no one to-day would have the temerity to claim for it any such virtues. Constructed of steel skeleton work, brick and terra cotta, it is still far from being fireproof. In razing the old structure it was shown to anyone who cared to study the subject that the iron and steel framework was not protected by any fireproof clay material or terra cotta. In those days it was not considered necessary to inclose the supporting framework in fireproof material.

In the new Plaza Hotel several million dollars will be invested, and it will be seventeen stories high and contain upward of 700 rooms. It will be made absolutely fireproof according to the very latest methods of construction. The supporting pillars, beams and girders will be protected by fireproof porous terra cotta, and the partitions made of burnt clay tile. Every possible equipment that will render the hotel safe from internal and external fires will be employed, and when it is ready for occupancy next fall it will have few equals and no superior in the city. A contrast between the old and the new Plaza will exemplify the remarkable advances made in fireproof construction within a few years, and incidentally it may be said that it will show how thoroughly equipped modern building companies are for rapid construction of such costly structures. The wreckers began to destroy the Plaza last July, and by next September the new hotel will be ready for public use. Thus inhabitants of a city may still carry vividly in the mind the characteristics of the old while the new is being completed.

Another great public building which inaugurates the rebuilding of Manhattan is the new Astor apartment hotel which will be built at Broadway and Seventy-eighth and Seventy-ninth streets. This will be the largest apartment hotel in the world, and will cost upward of $4,000,000. The building will cover a plot of ground 200 feet on Broadway and 225 feet on the side streets. Two stories will be built under the streets and eighteen above the surface level, making a twenty-story structure in all. A subbasement will be constructed for accommodating the power, heating and lighting plants. The furnaces and machinery will rest on concrete floors and be completely inclosed in walls of fireproof clay so that any fire once starting in the engine or dynamo room can not possibly extend to the basement above. The building will be made of the usual steel framework, well protected by fireproof tiles, and the floors and partitions will similarly be protected from interior flames. Each suite of rooms will represent an independent fireproof structure which can be completely isolated from all other parts of the building in times of fire. Practically no wood other than furniture will be used in the building, and there have been reports that even the furniture will be specially made of so-called fireproofed wood to limit the spread of an interior fire. While marble, glass, onyx and light stone will be used freely for ornamental work, none of these materials will carry any of the load or be placed next to supporting columns or beams. A fire could crumble the marble and stone without in any way affecting the main structural walls, partitions and floors.

In office buildings the same tendency toward the construction of mammoth skyscrapers representing the highest in modern fireproofing is apparent in the plans drawn and in the process of execution. The high building is particularly popular in New York, and the city is committed to this form of building more than ever. It is the only possible way of rebuilding the older sections of the town. Land is too valuable for small buildings, no matter how ornate and artistic they may be. Utility appeals first to the owners of real estate, and then if architectural lines of beauty can be added thereto all is well.

Now the higher the building the more important it is that the fireproofing and durable qualities of material and workmanship should be. This is an accepted maxim of modern building, and the architect and builder who essays to draw plans for a fifteen to twenty story building spends much time in selecting the best. In such buildings the tendency is to choose only those materials and principles of construction which have been subjected to repeatedly severe tests. The uncertain is excluded, no matter how promising it may seem. There is no room for experimental work in a million dollar building. Capital seeking investment to this extent demands something reliable, and the property must possess a degree of permanency against fire and deterioration by time and the elements to an unusual extent.

The new office buildings going up in New York are nearly all of this type. A few minor improvements are made here and there, but the conventional form of construction is mostly followed. Engineers may find some improvement in the distribution of the load so that the skeleton work is modified and changed slightly, but the chief essentials of fireproofing the walls, ceilings and floors are followed carefully according to the general rules. In the new twenty-three-story office building of the United States Express Company at Greenwich, Rector streets and Trinity place, a million and a half dollars are being invested, and this structure will have an exterior of brick, stone and terra cotta. The usual structural steel and iron framework will carry the loads, fireproofed and protected at every point by porous terra cotta tiles. The building when completed will represent another mammoth structure that offers an effectual fire barrier to a conflagration in the lower part of New York. It is believed that within a few more years nearly every down-town block will have one or more such buildings on it, and in the case of a fire no great spread of the flames is possible. Each fireproof structure of this kind offers a resistance to the spread of flames which makes it comparatively easy for the fire department to check them. It is the confession of the chief of the New York fire department that such buildings protect a city far more than any invention of modern fire-fighting apparatus, and that a great conflagration such as the Baltimore fire is impossible in a city where numerous fireproof buildings are located on every block. Yet it may be remembered that a few years ago doubt was expressed about the danger of tall buildings. It was supposed then that a fire starting in one of these would be beyond the control of the fire department, and the flames might easily spread over a wide area. But this was in the days before interior fireproofing was carried to its present state of improvement. To-day an interior fire could be limited to a few rooms so that its spread would be impossible except where high explosives were stored which might shatter and destroy walls and floors.

The new ten-story building of the Title Guarantee & Trust Company at 176 Broadway will represent another rather imposing fireproof structure, displacing small, combustible buildings which now stand on the site. This building is smaller than many of the others, but it will be none the less fireproof in structure and finish. The architects are called upon to build for future additions to it. The foundations and structural work are unusually heavy for a ten-story building, but this is for the purpose of furnishing sufficient strength for further additions in time if conditions warrant it. Very few builders to-day in the lower part of the city make such ventures. The conditions of business in the down-town districts are sufficiently settled to warrant the construction of offices for permanent investment, and the very highest and largest are built without any doubt as to their financial returns.

One of the most impressive features of the work of rebuilding Manhattan Island is the construction of apartment houses and apartment hotels. The private house is no longer popular to owners. It does not pay, owing to the high price of land, and only the very wealthy build private houses. The few that are put up are not for speculative purposes, but for private use, and these are generally fireproof houses equipped with every modern convenience, such as electric elevators and inclosed fireproof halls and stairways.

The great bulk of New York's population lives in tenements, apartment houses or apartment hotels. These buildings are going up rapidly in all parts of the newer sections of the town. They are built for poor and rich alike. Half a dozen new apartment houses were opened this fail whose rents range from $2,000 to $5,000 for suites of nine to ten rooms, and others are planned. Buildings of this character are without question fireproof and as substantial as the down-town office buildings. Their designs and constructive work require the highest ability of experts, and the tenants who occupy them belong to a class who demand the very best that money can secure.

A typical apartment building of this class is being constructed for the Gotham Realty & Construction Company at Eighty-first street and Columbus avenue. It is a twelve-story house, and will cost about $1,000,000. The foundations are of concrete and granite, the framework of structural steel and iron, the walls of brick, terra cotta and fireproof tiles. The elevators will be inclosed in fireproof wells which can be shut off from the rest of the buildings so that a fire starting in the basement and pouring up the elevator shaft could find no outlet except at the roof. Filtering plants, refrigeration and cold storage plants, as well as power and heat machinery, will be installed in the basement.

Somewhat less ambitious apartment houses are in the course of planning or building which stand equally high from a fireproof point of view. Brick, stone, terra cotta, fireproof tile, concrete and structural steel and iron are the chief building materials used. Many of these occupy whole blocks, and others are built in groups so that solid block fire barriers are made by them. The importance of this rebuilding of whole city blocks in the residential districts has not been fully appreciated in the past. The owners and builders have made their investments with an eye single to profitable returns. No altruistic spirit has affected them, and not even civic pride, probably, has entered into the building problem. Fireproof materials and methods of construction have been adopted because the city laws partly compel it, because tenants of fashionable apartment houses demand it, and because it has been demonstrated to the most pessimistic that a permanent fireproof structure pays better in the end. But beyond all these advantages there is another which is of general value to the city. Like the tall skyscrapers in the lower part of the city these up-town fireproof apartment houses serve as fire walls or barriers which make the spread of a great conflagration difficult. A single row of such apartment houses on a block would give the fire department the opportunity to check the spread of a fire that had got beyond their control. In other words, the rebuilding of the residential districts is making the city proof against great fires, and each year the danger must necessarily diminish.

Two recently completed buildings, which are in a class by themselves, deserve a word of notice in the rebuilding of New York. These buildings are the new Tiffany structure on Fifth avenue and Thirty-seventh street, and the new Gorham building at Fifth avenue and Thirty-sixth street. Ostensibly these structures are built for the special storage of great wealth represented in gold and silver ware and precious jewels. Owing to the business standing of the two firms concessions had to be made to the tastes of wealthy patrons, and consequently the architects were compelled to exert themselves to develop harmonious lines of construction and carry out elaborate plans of ornamentation. A great amount of limestone facing, marble and granite ornamentation, and wood decoration is employed both in the interior and exterior. But the main walls of the buildings are thoroughly fireproof, and on the sides abutting upon other property special care has been made to secure double fireproof walls. In the Tiffany store some $3,000,000 worth of jewels and gems are kept, and in the Gorham structure about $2,500,000 worth of finished gold and silver articles, cut glass and fine pottery.

The storing of such great wealth in single buildings has called for unusually safe methods for protecting them from both fire and burglary. Besides the ordinary fireproof walls, partitions and ceilings, vaults and safes are built into the structure and surrounded by double partitions of hollow, porous clay tiles and terra cotta. The vaults are in the sub-basement where the greatest ingenuity is exercised in defeating the aims of burglars and warding off fire. The steel vaults are protected by doors weighing three and a half tons, and the section in which they are located is shut off from all the rest of the building by fireproof partitions and walls. There are only seven stories to the Tiffany building, and it is extremely ornamental in front, with every appearance of artistic construction. Yet the shell of the whole building is constructed of structural iron and steel and terra cotta. Likewise the Gorham building is only eight stories in height, and is ornamented with a profusion of beautifully colored limestones, marble and granite. This building is one of the first in the city to be entirely built of Guastavino arches, a system consisting of a series of doomed arches formed of overlapping tiles and supported on iron columns.

An authority has recently compiled a set of figures to show that New York possesses by all odds the greatest number of fireproof buildings of any city in this country, the approximate number being 1,389 for Manhattan and the Bronx, 298 for Chicago, and 265 for Boston; but whether these statistics are correct or not it can hardly be questioned that in the present building boom New York has more fireproof buildings planned or in the course of construction than either Chicago or Boston. It is estimated by architects and engineers that within two years upward of 500 more fireproof buildings will be added to the city's present number,. and that in the future all building enterprises of any considerable size will be solely of fireproof structures. In other words the semi-fireproof building in New York is out of date, and the old-fashioned combustible structure will be rapidly razed to the ground to make room for more commodious and safer structures.

George E. Walsh.

TEST OF A WATER CURTAIN IN THE BROADWAY THEATER, DENVER

(From the Rocky Mountain News.)

Water curtains have been installed in all but one of the Denver theaters as an additional protection against fire, and the managers of the theaters were all present to witness the test.

It was pronounced a great success and flooded the stage and the asbestos curtain with a sheet of water. It was feared that the water taken by the curtain would diminish the hose supply to such an extent that the curtain would be useless, but a hose was attached to the fire plug in the basement and run out of the back door. It threw a stream nearly to Lincoln avenue, and did not make any perceptible difference in the force of the stream.

The water curtain is made by a 40-foot pipe, which is attached to the top of the curtain and to the two supply pipes on either end of the stage. The pipe is perforated and when the water is turned on it sends a sheet of water down the inside of the curtain, thus preventing any danger of the flames scorching the curtain. The underwriting representatives present were highly pleased and are satisfied that they now have a fireproof curtain that will never fail to work.

FURTHER RAMBLINGS.

BY F. W. FITZPATRICK.

TWO good movements have recently been inaugurated in New York. One, the encouragement of private fire-fighting plants, a species of stationary fire-department adjuncts in the more crowded districts. And there is no reason why cities should not make arrangements with big hotels, lighting plants, manufactories, etc., to install additional pumping appliances, always ready for instant use, that may be called into service by the fire department in fighting fires in that vicinity, thus securing prompter and better service than by the fire engines that have to be driven to the scene of action at the peril of street traffic. So much for cure. The other movement is toward prevention. The idea is to virtually rebuild the New York waterfront, erecting concrete docks instead of the dangerous wooden affairs at present in use, and fireproof dockhouses. They certainly have a splendid model in the Hamburg-American dockhouses recently completed. Give us something as good as that, as fire resisting, as utilitarian, costing as little and as handsome in appearance, and we will be perfectly satisfied with our harbor fronts.

Think of it. There were 10,122 buildings erected in New York, Greater New York, last year, involving an expenditure of $147,000,000. Is it any wonder that New Yorkers look upon their city as a little world of its own and simply ignore all that's going on elsewhere, or is it to be wondered at that the city has become such a mecca for architects? It seems quite natural for the poor fellow who thinks he has ability and is struggling for a living in a city doing but half a million or a million of building a year, to believe or hope that there is an opening for him where the hundred million mark has been left half a lap behind. Some of these ambitious men make a place for themselves in that exceedingly clannish community, while others drift about, go into the employ of more successful men or return disappointed and sour with the world to where they can at least make their bread and butter. I know of one man for whom I have a certain amount of sympathy, however I may despise his methods and condemn his moral and other shortcomings, whose case will serve as an illustration. A few years ago this man had a most lucrative practice in a western city but took the notion that only New York was his size, the fairest field for his ambition, and in his endeavors, his scrambles to get into the Four Hundred of the profession there, he has resorted to every species of unholy tactics that have brought down condemnation, virtual ostracism from the profession, the contempt of all right-minded men, and, incidentally, completely lost the business, the very satisfactory business, he was doing in the West, and all that without any corresponding gain in the city of his adoption, or at least I never hear of him as having accomplished anything there. Even if one is not gifted by Nature with any superabundant sense of honor and integrity, it surely does not even "pay" to let overweening ambition get the better of one so that he forgets what men think of the former in his haste to secure the fruits of the latter.

* * *

My attention has just been called to a rather interesting coincidence, the very striking similarity of the figures of our two smoke bills, fire smoke and tobacco smoke.

The records for both, last year, were very much akin. The nation certainly has grown to mammoth proportions when, as a people, we can smoke up $264,000,000 in tobacco and throw away $230,000,000 in burnt buildings in a twelve-month! It is confidently expected that the tobacco smoke bill will reach the $300,000,000 mark this year; pray heaven our fire bill may not compete for pre-eminence.

Writing of fire, I just happen to have some figures beside me that show that in the year just passed, ending June 30, 4,686 public buildings, courts, schools, colleges, theaters, etc., have been totally destroyed or very seriously damaged by fire. And yet, right in New York, they are putting up 10,122 buildings of which only about 486 can lay any claim to respectability of construction, and but 208 have any right in the class of fireproof structures.

* * *

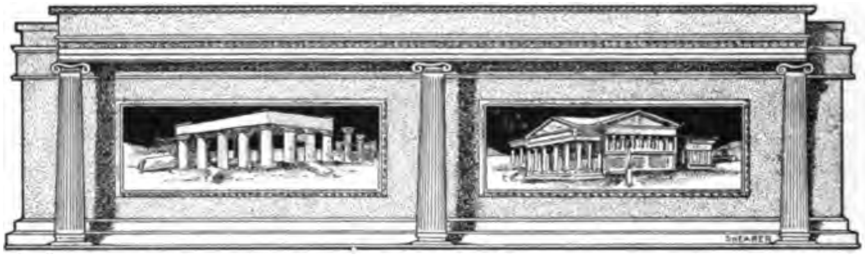
Dollars are what appeal to the average business-man when it comes to building. The following illustration may not be without value to architects who are advising fireproof construction. Six years ago I planned a warehouse. We built it of tile and steel and brick, with not a particle of wood to it, even the sashes were of metal and wired glass and the floors were cement, the doors were iron. Being so located that it was not endangered by its surroundings, that is, there were no high buildings that might fall upon it nor was there a possibility of a conflagration warping its metal sash and doors and effecting, however insignificant, injury to the structure, the only danger was from within; and that was carefully guarded against by absence of open wells and other vertical openings through the stories; by the building being cut up into small units and having ample fire protection and efficient automatic and human guard. I advised my client under the conditions to abstain from any insurance whatever upon the structure. The saving of premiums thus effected covered more than the cost of the difference between what the building cost and the cost of an ordinary structure, in less than two years, or a return of 58¼ per cent per year on the additional amount he had to pay to properly construct his building. I submit that that is a pretty good return on the investment. Lately, there have been built some other large and, unfortunately, not as well built warehouses adjacent to him. A disastrous fire in the neighborhood could effect some external damage. Iron beams and tons of stone work could be dumped upon his roof, for instance, so that he is now carrying some insurance, but six years of absolute safety have yielded him infinite satisfaction, over three times as much money as he first put into the difference of building, and has made him feel so good about the matter in general that he is about to duplicate that structure in three other places. The only changes that have occurred to us are the substitution of asbestos for the sash and doors instead of metal and an asbestos shingle instead of a rather expensive tile roof.

* * *

I listened to a talk the other day given by an instructor in engineering to a class of youngsters, just beginning to study construction, that interested me. I was rather surprised to find an old man in an old school give vent to such real good, sensible ideas as he did. Speaking of various modes of construction of fireproof buildings, he said: "In weak tensile material, subject to strain, the best practice of ancients and moderns teaches us that small units are better than the large ones. Man, early in his development, built of timbers and covered considerable spans; later, he began to use stone, he attempted to adapt it in the same manner, making huge lintels covering openings and ceilings. Accidents were frequent, fissures and veins in the stone developed weaknesses not apparent at first, and little by little, man got into the idea of cutting stones into key-shape and building arches of them with which he could span far greater spaces. That is virtually, too, what is being done to-day in the construction of fireproof floors. The best system of fireproofing known is made up of segmental arches of fireproof tile, no one of which is over 2 feet square, small units, and developing wonderful strength and resistance to the elements. In the new fad of cheap concrete construction, they have attempted to take a material that has no tensile strength and make a monolithic lintel of it. Realizing its inherent weakness, they have added tensile members, steel bars, wires, etc., whose expansion and contraction are not at all similar to those of the inert mass, resulting in that the two do not always knit, and having for effect that you frequently see in the daily papers reports of buildings that have collapsed. It is an attractive problem for speculative engineers to play with, but not a system of construction that should be approved or indulged in for general use."

* * *

Writing about concrete, that mode of construction that I had almost forgotten about last month, I recently received some interesting reports concerning the collapse of the Madrid waterworks reservoir, a great mass of opinions, reports, figures, etc., that, however, do not show that matter in any brighter light than that shed upon it by the *American Contractor* of September 23, a journal usually rampantly in favor of everything that is concrete, which says: "That the expansion of concrete, particularly when employed in connection with steel, raises quite a serious problem and one that will have to be given greater attention than has hitherto been awarded to it, is strongly suggested if not made quite clear by the results observed since the concrete steel reservoir at the Madrid waterworks collapsed with most disastrous results in April last. In June it was discovered that the main girders connecting the columns of two other service reservoirs were expanding under the heat of summer to such an extent that they were assuming a curved form, at the same time seriously distorting many of the columns. So rapid was the work of destruction that in a few days some two hundred columns were thrown down. This was not attended with any loss of life, as access to the work had been strictly prohibited by the thoroughly alarmed authorities. Through a reduction of the temperature, further destruction was prevented, but, in the opinion of some engineers, the works are doomed, since the temperature cannot always be kept down in a city where its natural range is 65°. The expansion of the concrete employed seems to have been overlooked by the designing engineers. The lesson to be drawn from this condition may well prove of great value to all designers of concrete steel construction." A range of 65 degrees is less than what obtains in most of our cities, and, what is worse, there are few engineers and still fewer architects who know enough about the idiosyncrasies of steel and concrete to make due allowance for their relative expansion and contraction. As the old professor suggested, let the votaries of the fad experiment at experimental stations and let all others build buildings that are to be occupied by live people, of safe, sound, sensible construction.



A REINFORCED CONCRETE PAPER WAREHOUSE

BY HARRY D. GUE.

THE type of the mill and warehouse of the future is not far to seek. Some years ago Mr. Edward Atkinson recognized, in a well considered paper, that the time was not far distant when the increasing cost of heavy timber would preclude the erection of "slow burning" mill construction.

While it can be hardly said that this condition is already here, the excess of cost of highly fire-retardant construction is so comparatively small that many long-headed owners are building for the future, and hollow tile and concrete warehouses and mills are springing up in all parts of the country.

As a class these buildings show several distinguishing features. Walls, floors and roof are proof against serious damage by fire, all exposed structural metal and woodwork are eliminated; all communications between floors are enclosed in fireproof shafts or partitions; light openings in both walls and roofs are proportionately large and glazed with wire glass, and where occupation is hazardous automatic sprinklers are installed. Buildings erected on these specifications are good business investments. Repairs are minimized, insurance premiums are of the smallest and the greatest immunity to fire loss is secured.

It was the intention of the Robert Gair Company in planning for their new factory and warehouse to be located on Water street between Washington and Adams streets, Brooklyn, to build the same similar to their present buildings; that is, of slow burning mill construction, using brick walls with yellow pine girders and double wood floors. Plans had been completed for this form of construction and their representative was in the South to purchase the timber. He found it almost impossible to secure a good selection of yellow pine for prompt delivery and returned, suggesting to his company that further information be obtained regarding the merits of reinforced concrete for factory and warehouse construction. Prices were obtained for a similar building, in size 100 by 200 feet, constructed entirely of reinforced concrete. It was decided immediately to accept this form of construction, changing, however, from a six-story and basement building to an eight-story and basement building, the height being originally limited by the building requirements for non-fireproof buildings. The use of reinforced concrete eliminated this restriction. It was determined further that the building should be made as nearly fire resisting as was possible, eliminating all timber or wood work; all floors to be cut off by means of fireproof partitions enclosing elevator and stair wells, and all interior and exterior doors to be constructed of wood covered with metal. It was also decided to obtain the maximum window area in order to afford natural light for manufacturing purposes. This feature determined the general design of building, which consists of a sekeleton carried up similarly to the

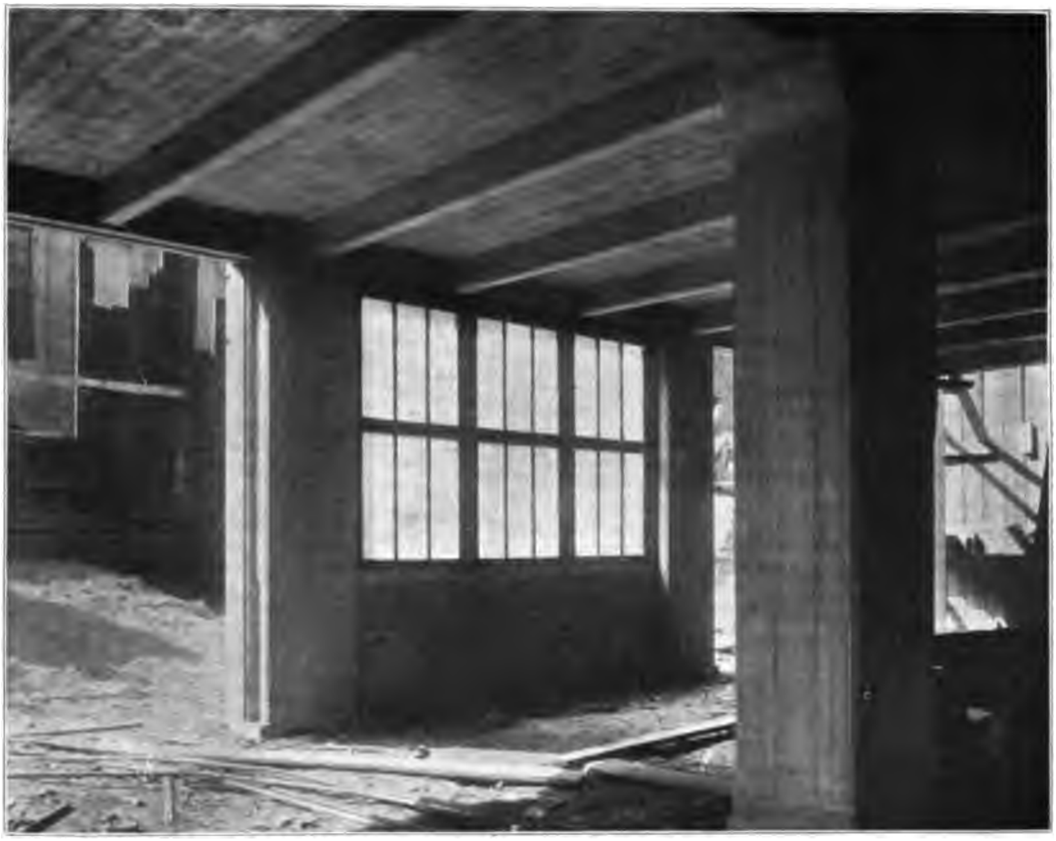


FIG. I—TYPICAL WINDOW OF WIREGLASS IN HOLLOW METAL FRAMING.

construction of steel buildings, filling in later the curtain wall between the wall girders and window sills, the balance of the area between sill, wall girder and piers filled in with a window.

In all fire-retardant buildings in which the internal vertical fire hazard is eliminated, a condition is brought into being which has been aptly termed "Auto-exposure." This is the likelihood of fire being contributed from one floor, through outside windows and in again, to floors above or below in the same building. This danger is entirely distinct from the exposure hazard presented by a neighboring building, and is greatest when the floors are most thoroughly separated. Particularly where the proportion of window to wall area is large, but one satisfactory solution exists to this problem: Wire glass in noncombustible frames. The window area of the Gair building exceeds 50 per cent of the wall space and a typical window of Mississippi wire glass in Voigtmann hollow metal frames is shown in Fig. 1. The windows generally have a width of about 12 feet and a height of 8 feet, divided into six sashes, all of them being fixed excepting two of the upper sashes which are pivoted and arranged to close automatically in case of fire. The frames are constructed of No. 22 galvanized iron and the sashes of No. 24 galvanized iron.

The interior footings were constructed 12 feet square, reinforced with twisted steel rods to take up the bending moment in a similar manner to the design of steel grillage foundations. The pressure on the soil, which consists of a fine sand, was limited to 2 tons per square foot, with all floors fully loaded. The exterior footings under

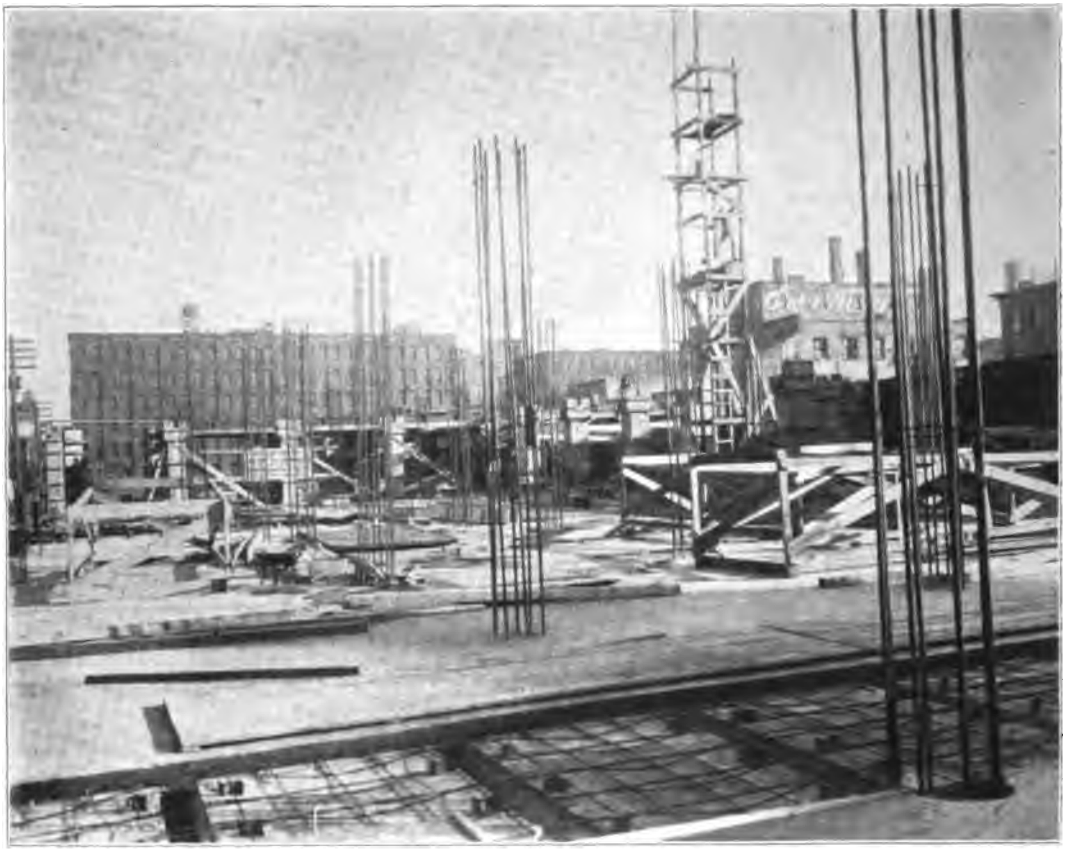


FIG. II—DETAIL OF COLUMN REINFORCEMENT.

the walls and wall columns consist of continuous girders of reinforced concrete.

The interior columns are square with corners rounded to a 2-inch radius, knee braced at the girder connections. They are reinforced with vertical round rods running through two stories with the connections about 12 inches above the floor line. The ends of the rods are threaded and connected with sleeve nuts, making the vertical steel members continuous. The horizontal reinforcement consists of a spiral made from a ¼ inch diameter wire having a pitch of 4 inches in the basement columns and increasing to 6 inches in the top story. The concrete for all interior columns was mixed in the proportion of 1 part Portland cement, 2 parts sand and 3 parts trap rock using ¾-inch and 1½-inch stone in equal proportions. The concrete in the columns was very carefully inspected and the work thoroughly done. Fig. 2 illustrates this column construction.

The layout or spacing of the beams and girders for the floor construction was similar to a steel layout. The columns are spaced 16 feet by 16 feet 4 inches, 3 beams to a bay, making a spacing of 5 feet 4 inches for the beams (See Fig. 3.) The beams are 7 inches wide and project 11 inches below the floor slab. The girders are 12 inches wide and project 15 inches below the floor slab. The floor slab is 4½ inches thick, including the finish floor, which consists of ¾ inch of Portland cement mortar troweled to a hard smooth surface. All concrete for floors was mixed in the proportion of 1 part cement, 3 parts sand and 5 parts ¾-inch trap rock. The floors were designed for a working load of 200 pounds per square foot and

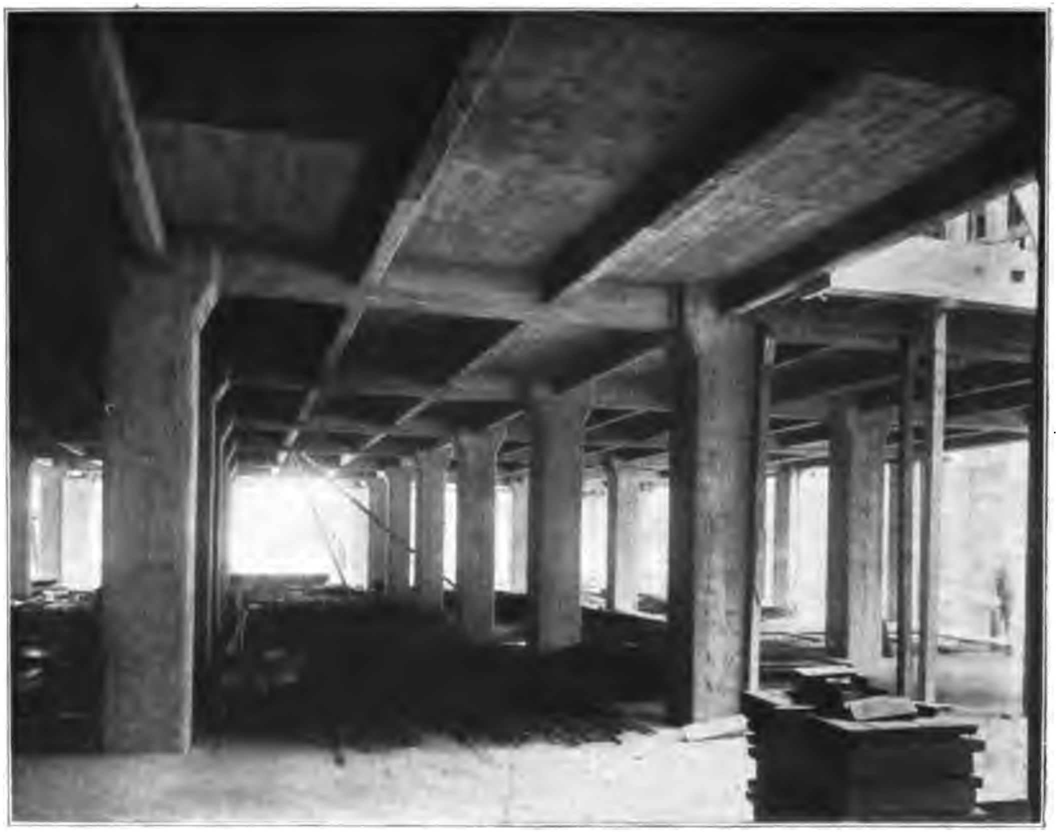


FIG. III—INTERIOR VIEW OF TYPICAL FLOOR, SHOWING BEAM, GIRDER AND COLUMN ARRANGEMENT.

full-sized bays were tested with a load of 600 pounds per square foot, uniformly distributed. This test load produced a deflection of from 1-16 inch to 3-32 inch in beams and 1-16 inch in girders, without showing any signs whatever of injury. The construction of the roof was similar in all respects to the floor construction, excepting that the live load was taken at 50 pounds per square foot.

The construction of three street fronts consists of vertical columns with curtain walls terminating at the window sill. (See Fig. 4.) These columns are reinforced with vertical rods of twisted steel with horizontal hooping of ¼-inch twisted steel bars placed 12 inches on centers. They are 3 feet 6 inches wide by 2 feet thick in the lower stories, decreasing to 15 inches in thickness in the top story. The wall girders were constructed with the floors and received the curtain walls, which are 8 inches in thickness reinforced with steel rods placed both horizontally and vertically. The rear wall for half the building contains no windows and the other half has comparatively small windows, since the remainder of the block will be built up. The cornice consists of a blank wall carried about 10 feet above the roof to receive the name of the company on the three street fronts. Great care was taken in the construction of the exterior columns and walls in order to insure a good smooth surface for the finish work. Practically no pointing has been done to the exterior.

The building has three stair walls cut off by fireproof partitions, and stairs are constructed of reinforced concrete having a finish on the risers and treads similar to the floor finish of the building.

The partitions enclosing the stair

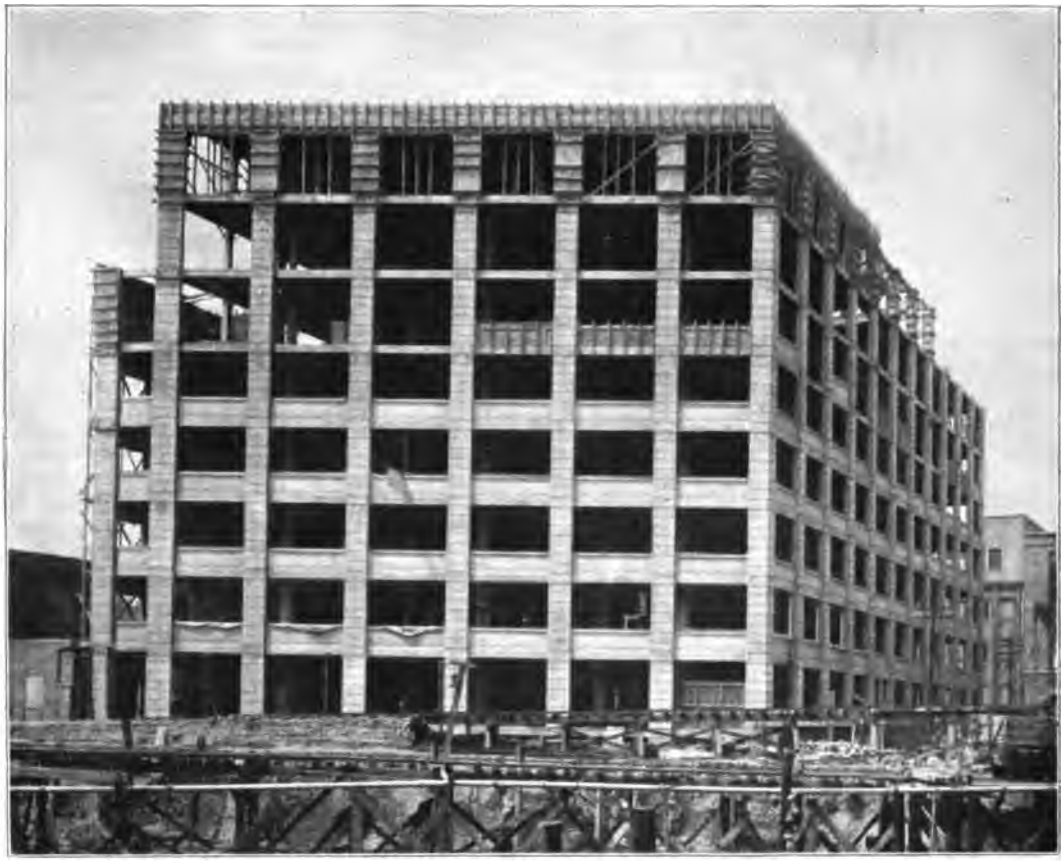


FIG. IV—EXTERIOR VIEW, NEARING COMPLETION, SHOWING UNUSUAL WINDOW AREA.

and elevator wells are constructed of concrete 4 inches in thickness, reinforced with both vertical and horizontal twisted steel bars. All openings for doors are lined with iron to protect them against possible damage through usage. The building is divided in half, to reduce the fire risk, by means of a partition along the center line of columns. This partition is also 4 inches in thickness reinforced with twisted steel rods, and the one opening or doorway on each floor between the two sections is protected by double fire doors.

All exterior entrance doors are constructed of wood covered with No. 24 galvanized iron with glass panels glazed with Mississippi wire glass. The interior doors are constructed in accordance with the regulations of the New York Board of Fire Underwriters for standard fire doors.

All interior walls, columns and ceiling surfaces are painted with cold water paint applied with a brush, giving a very pleasing effect and to the layman having the appearance of a plastered building.

IN GENERAL.

The contractors' plant consisted of a Ransome mixer of a size to mix half yard batches, and was located in the basement of the building. This mixer discharged into a Ransome self-dumping bucket, which was hoisted up through the hatchway left in the floor construction and dumped automatically at the floor where the work was being carried on. Both the mixer and hoist were driven by electricity.

Cement, sand and stone were stored in the basement of the building

All form work was carefully constructed, using dressed lumber, and considerable pains were taken to secure a smooth finish of the work. This is clearly indicated in the interior views shown. Practically no pointing or plastering was necessary on any of the columns, beams or girders, and not a foot of concrete had to be removed in any part of the building because of defective material or workmanship.

All materials were carefully inspected as well as the operation of mixing and placing the concrete. The steel reinforcement was placed in the beams and girders and secured in position to prevent displacement during construction.

The cost of the building ran about 10 per cent above the cost of the slow burning mill construction, including, however, in the cost of the concrete construction the metal window frames and wire glass as against the wood frames and plain glass in the original design.

Four-inch cubes were made from the run of concrete each day and were tested at intervals of 7, 14, 28 and 60 days. These cubes gave remarkably close results, satisfying the owner and architect as to the uniformity of the materials being used in the construction of the building.

Work was carried forward with good speed and averaged two stories per month.

The architect for the building was William Higginson, Park Row building, New York City, and the reinforced concrete designed by H. C. Turner, C. E., 11 Broadway, New York City.

THE FIRE RESISTANCE OF DIFFERENT CONCRETES

From the *Engineering Record*, July 22, 1905.

THE committee on cement for building construction of the National Fire Protection Association has recently conducted a series of tests at the Underwriters' Laboratories to determine the relative fire resistance of concrete composed of various materials in different proportions, so that when the requisite superintendence is available to enforce good workmanship a building of high fire resistance may be obtained. These tests were based on the theory that concrete construction depends for its fire resistance chiefly, if not wholly, not on the style of its reinforcement, but on two essential qualities of the concrete itself, viz.: its ability to withstand cracking or disintegration which should reduce its own strength or expose the steel it was designed to protect, and its heat insulating value as a steel protection even when not broken or disintegrated.

The samples for test were in the form of beams 8x11¼ in. x6 ft., each containing three plain round steel rods 6½ ft. long, and projecting about 3 in. at each end and located 1, 2 and 3 in., respectively, from the bottom of the beam. Holes were left from about the middle of each rod to the top surface of the beam for the purpose of inserting thermometers for measuring the degree of heat transmitted to the various rods.

* * *

The samples were all made on April 1 by experienced workmen under the direction of Messrs. R. & S. Sollitt of Chicago, a prominent firm engaged in that sort of work as contractors. In mixing the sand and cement were laid down first and turned over with shovels four times, then the stone and water added and the whole shoveled over four or five times more, enough water being added to make a medium wet mixture. The beams were taken out of the molds and left, both before and after removal from the forms, in the shaded corner of an open yard, where they were occasionally wet by rain. At the age of 45 to 48 days the beams were tested two at a time while laid so as to form the roof of a low brick furnace 2½ ft. wide, 4 ft. long and 2½ ft. deep in the clear. Ventilating holes 3x8 in. were left at each side of each beam on both ends of the furnace. The furnace was heated by two 3-in. Bunsen burners, using natural gas, over which was laid an open brick lattice work to distribute the heat evenly through the chamber.

A Le Chatelier pyrometer was inserted through the top of the furnace so that its point was between the two samples and about an inch below their lower surface, and three standard mercury thermometers reading up to 650° F. were inserted in each beam with their bulbs resting on the steel rods. No attempt was made to load the beams.

Each sample was kept in this furnace three hours, while the temperature as indicated by the pyrometer gradually rose to about 1,900° to 2,000° F. They were then taken out and allowed to cool in the open air without the application of water. While there is some difference in the speed with which temperature rose, there is no indication that the difference in the materials composing the concrete was an important factor in the insulating quality of the product, except in the case of the two cinder samples, in both of which the rise in temperature of the rods was quite noticeably slower than in any other sample. There also is a clear indication that the richer mixtures of all materials were slower conductors. .

The time required to heat up the rods in all samples which had only one inch of concrete covering as compared with those covered 2 and 3 in. deep is the prominent feature of the temperature records and indicates clearly that reinforcing steel members covered to that depth only reached a temperature of 770° F., where their strength is impaired to the extent of 25 per cent. very early, well within 1½ hours, or averaging 59 minutes for the 11 samples. Those with 2-in. covering attained the same temperature in an average of 2 hours and 20 minutes, and those protected by 3 in. of material in 2½ hours on an average.

In none of the samples was there any sign of breaking or chipping off of the concrete during the fire, but after being removed it was found that the material had lost practically all its strength to a depth of about 4 in. from the sides and bottom and that it had softened perceptibly clear to the top. The cement and most of the stone, including both limestone, gravel and granite, seem to have been calcined quite thoroughly at the surface and in a diminishing degree up to about 4-in. depth. There is no very wide difference in this respect between the various samples, though the beams having the greatest proportion of cement seem to be somewhat more solid than the others.

In all cases a little water and steam appeared during the test at a few cracks running across the top of the beams, this being most noticeable in the richest mixtures and appearing chiefly during the time the thermometers indicated 212° F., as they did for periods of 20 to 40 minutes.

* * *

The tests were planned to give a severe but not excessive trial as to duration and temperature of furnace, but the committee feel that they were distinctly favorable to the materials in that no load was applied and that they were not wet by hose streams while hot—with the limited time and facilities at hand it was not feasible to arrange these conditions—but it is quite probable that with added strains, imposed by loading or wetting, less favorable results might have been obtained.

The committee suggested the following general principles on which such work should be planned:

First—The work should invariably be designed and its entire erection supervised personally by engineers of skill and experience in this particular line.

Second—Concrete for fireproof construction should be composed of high-grade tested Portland cement, clean sand and broken stone, gravel, slag or cinders so proportioned that the cement will completely fill the voids in the sand and the mortar thus formed will a little more than fill the voids in the aggregate.

Third—The materials should be well mixed by machine with enough water to make the mass distinctly a "wet mixture," and should be tamped down so that no voids are left.

Fourth—All steel members of whatever style should be imbedded at least 2 in. in the concrete, and in the case of important load-carrying members, 3 in.

The committee was not yet able to make any tests of fire resistance of these blocks, but would venture the opinion that when made in the proportions of one to four or five, they would not be found to differ widely from other forms of concrete as to heat conductivity or tendency to disintegration, but the fact that they are hollow and that the side of the shell next the fire would heat up more rapidly than the other sides would allow an unequal expansion which might result in the hottest side breaking away from the others, in exactly the same manner as hollow tile breaks. Whether this theory is correct or not, and if so, at what temperatures and at what time in the fire serious breaking would occur, should be the subject of investigation. Another important question is, what effect fire would have on the mortar joints between these blocks.

UNIFORM BUILDING LAWS

RECOMMENDATIONS OF THE NATIONAL BOARD OF FIRE UNDERWRITERS FOR THE CONSTRUCTION OF FIREPROOF BUILDINGS

EVERY building erected or altered to be used as a theater, lodging house, school, jail, public station, hospital, asylum, institution for the use, care or treatment of persons, the height of which exceeds three stories and not more than 40 feet in height, and every building erected or altered to be used as a hotel or an apartment house which exceeds four stories and not more than 50 feet in height, and every other building the height of which exceeds 55 feet or more than four stories in height, shall be built fireproof.

They shall be constructed with walls of brick, stone, Portland cement concrete, iron or steel in which wood beams or lintels shall not be placed, and in which the floors and roofs shall be constructed with rolled wrought iron or steel floor beams, spaced not more than five feet on centers, for stores, warehouses and factory buildings, and for all other buildings not more than eight feet on centers and otherwise so arranged as to spacing and length of beams that the load to be supported by them, together with the weights of the materials used in the construction of the said floors, shall not cause a greater deflection of the said beams than 1-30 of an inch per foot of span under the total load. The beams shall be tied together at intervals of not more than eight times the depth of the beam with suitable tie-rods.

Between the floor and roof beams shall be placed brick arches springing from the lower flanges of the steel beams, or the spaces between the beams may be filled with hollow tile arches of hard-burnt clay of porous terra cotta, or arches of Portland cement concrete, plain or reinforced with metal, or such other fireproof composition may be used, provided that in each and all cases the strength and method of construction shall conform to the requirements of this code.

The stairs and staircase landings shall be constructed of brick, stone, Portland cement concrete, iron or steel, or a combination of these materials.

No woodwork or other inflammable material shall be used in any of the partitions, furrings or ceilings in any such fireproof buildings, excepting, however, that when the height of the building does not exceed eight stories nor more than 100 feet, the doors and windows and their frames and trims, the casings, the interior finish when filled solidly at the back with fireproof material, and the floor boards and sleepers directly thereunder, may be of wood, but the space between the sleepers shall be solidly filled with fireproof materials extending up to the underside of the floor boards.

When the height of a fireproof building exceeds eight stories, or more than 100 feet, the floor surfaces shall be of stone, cement, tiling or similar incombustible material. All outside window frames and sash shall be of metal.

The inside window frames and sash, doors, trim and other interior finish may be of metal or of wood covered with metal or of such other incombustible material that may be approved by the Commissioner of Buildings.

HALL AND PERMANENT PARTITIONS.

All hall partitions or permanent partitions between rooms in fireproof buildings shall be built of fireproof material and shall not be started on woodsills, nor on wood floor boards, but be built upon the fireproof construction of the floor and extending to the fireproof beam filling above.

But this shall not preclude the use of wood block under each iron upright or stud in partitions constructed of iron uprights and lathed with iron, or filled in solidly between the iron studs or uprights with approved fireproof material, provided said wood block or cushion which is to allow for the possible lengthwise expansion of the uprights by heat does not exceed in thickness 1-10 of an inch to the foot of the height of said uprights.

The tops of all door and window openings in such partitions shall be at least 12 inches below the ceiling line.

In all fireproof partitions, other than when made of solid brickwork, the openings for doors and windows in the same shall be framed on both sides with iron studs or uprights secured at top and bottom to the floor beams, and with like iron horizontals between the said uprights for the window openings and door heads.

In all fireproof buildings, other than stores, warehouses and factories, if exceeding three stories or 40 feet in height, the stair halls shall be closed on each story with fireproof material, same as required for elevators, to so form an inclosure the floor area of which shall not be more than three times the united area of the floor openings for the elevators and stairs.

FIREPROOF FLOOR FILLINGS BETWEEN BEAMS.

Between the wrought iron or steel floor beams shall be placed brick arches springing from the lower flanges of the steel beams.

Said brick arches shall be designed with a rise to safely carry the imposed load, but never less than 1¼ inches for each foot of span between the beams, and they shall have a thickness of not less than 4 inches for spans of 6 feet or less, and 8 inches for spans over 6 feet, or such additional thickness as may be required by the Commissioner of Buildings. Said brick arches shall be composed of good, hard brick or hollow brick of ordinary dimensions laid to a line on the centers, properly and solidly bonded, each longitudinal line of brick breaking joints with the adjoining lines in the same ring and with the ring under it when more than a 4-inch arch is used. The said arches shall spring from protecting skew-backs of burnt clay resting on and covering the lower flanges of the geams, so as to afford a minimum protection of 2 inches of solid burnt clay material underneath the finages, or otherwise entirely incasing the said flanges as provided for in this section. The brick shall be well wet and the joints filled in solid with cement mortar. The arches shall be well grouted and properly keyed.

HOLLOW TILE ARCHES OF BURNT CLAY OR TERRA COTTA.

Or the space between the beams may be filled in with hollow tile arches of hard-burnt clay, semi-porous or porous terra cotta of uniform density and hardness of burn. The shells and webs of hollow tile arch blocks shall not be less than 1 inch in thickness.

Skew-backs shall be used with all forms of hollow tile arches and be of such form and section to properly receive the thrust of the arches. The shells and webs of the skew-backs shall be not less than 1½ inches in thickness, except that the portion extending under the lower flanges of the beams shall be not less than 2 inches of solid material not interrupted by any interior cavities or spaces. The said arches shall be of a depth and sectional area to carry the load to be imposed thereon, without straining the material beyond its safe working load, but the thickness of the shells and walls shall in no case be less than herein required, and the depth shall not be less than 1¾ inches for each foot of span, not including any portion of the depth of the tile projecting below the underside of the beams, a variable distance being allowed of not over 6 inches in the span between the beams, if the soffits of the tile are horizontal; but if said arches are segmental, having a rise of not less than 1¼ inches for each foot of span, the depth of the tile shall be not less than 6 inches. The joints shall be solidly filled with cement mortar as required for common brick arches and the arch so constructed that the key parts shall always fall in the central portion. The shells and webs of all end construction blocks shall abut, one against another.

ARCHES OF PORTLAND CEMENT CONCRETE PLAIN OR REINFORCED WITH METAL.

Or the space between the beams may be filled with arches of Portland cement concrete, segmental in form, and which shall have a rise of not less than 1¼ inches for each foot of span between the beams. The concrete shall be not less than 4 inches in thickness at the crown of the arch and shall be mixed in the proportions required by this code. These segmental arches, if reinforced, shall in all cases be reinforced or protected with steel rods or bars, reticulated or meshed steel, or similar metal weighing not less than 1 pound per square foot, and having openings no larger than 3 inches square. Such reinforcing metal if essential to secure the required strength of the arches shall be so imbedded that the metal is covered by not less than 1 inch of the concrete; but if used partly or wholly as a centering for and if not essential to secure the required strength of the arches, the metal centering need not be wholly imbedded in the concrete.

No concrete work shall be installed in freezing weather, nor allowed to freeze after being put in place.

VARIOUS FILLINGS BETWEEN FLOOR BEAMS.

Or between the said beams may be placed solid or hollow burnt clay, brick, or concrete slabs in flat or curved shapes, concrete or other fireproof composition, and any of said materials may be used plain or in combination with wire cloth, expanded metal, wire strands, or wrought-iron or steel bars; said metal if used to be in all cases of imbedded in the fireproof composition or combination that the metal shall be covered by not less than 1 inch of the fireproof material; but in any such construction and as a precedent condition to the same being used, tests shall be made as herein provided by the manufacturer thereof under the direction and to the satisfaction of the Commissioner of Buildings, and evidence of the same shall be kept on file in the Department of Buildings, showing the nature and result of the test. Such tests shall be made by constructing within inclosure walls a platform consisting of four rolled steel beams, 10 inches deep, weighing each 25 pounds per lineal foot, and placed 4 feet between the centers, and connected by transverse tie rods, and with a clear span of 14 feet for the two interior beams and with the two outer beams supported on the side walls throughout their length, and with both a filling between the said beams, and a fireproof protection of the exposed parts of the beams of the system to be tested, constructed as in actual practice, with the quality of material ordinarily used in that system and the ceilling plastered below, as in a finished job; such filling between the two interior beams being loaded with a distributed load of 150 pounds per square foot of its area and all carried by such filling; and subjecting the platform so constructed to the continuous heat of a wood fire below, averaging not less than 1,700 degrees Fahr. for not less than four hours, during which time the platform shall have remained in such condition that no flame will have passed through the platform or any part of the same, and that no part of the load shall have fallen through, and that the beams shall have been protected from the heat to the extent that after applying to the underside of directed against the bottom of the platform and discharged through a 1⅛-inch nozzle under 60 pounds of pressure for the platform at the end of the heat test a stream of water five minutes, and after flooding the top of the platform with water under low pressure and then again applying the stream of water through the nozzle under the 60 pounds pressure to the bottom of the platform for five minutes, and after a total load of 600 pounds per square foot uniformly distributed over the middle bay shall have been applied and removed, after the platform shall have cooled, the maximum deflection of the interior beams shall not exceed 2½ inches. The Commissioner of Buildings may from time to time prescribe additional or different tests than the foregoing for systems of filling between iron or steel floor beams, and the protection of the exposed parts of the beams. Any system failing to meet the requirements of the test of heat, water and weight as herein prescribed shall be prohibited from use in any building hereafter erected. Duly authenticated records of the test heretofore made of any system of fireproof floor filling and protection of the exposed parts of the beams may be presented to the Commissioner of Buildings, and if the same be satisfactory to said Commissioner it shall be accepted as conclusive.

PROTECTION AGAINST INJURY BY FREEZING.

No filling of any kind which may be injured by frost shall be placed between said floor beams during freezing weather, and if the filling is placed during any winter month, it shall be temporarily covered with suitable material for protection from being frozen.

CINDER CONCRETE FILLING ON TOP.

On top of any arch, lintel or other device which does not extend to the plane of the underside of the floor finish, cinder concrete or other suitable fireproof material shall be placed to solidly fill up the space to a level with the top of said floor beams, and shall be carried to the underside of the wood floor boards in case such be used.

Cinder concrete shall be made with not less than 1 part of Portland cement by volume, to 10 parts of other material, and the flanges of all beams shall be entirely imbedded in same to a depth of not less than 2 inches.

TEMPORARY CENTERING.

Temporary centering when used in placing fireproof system between floor beams shall not be removed within 24 hours, or until such time as the mortar or material has set.

STRENGTH FOR FIREPROOF FLOOR FILLINGS.

All fireproof floor systems shall be of sufficient strength to safety carry the load to be imposed thereon without straining the material in any case beyond its safe working load.

PIPE OPENINGS THROUGH FIREPROOF FLOORS.

Openings through fireproof floors for pipes, conduits and similar purposes shall be shown on plans filed in the Department of Buildings.

After the floors are constructed no opening greater than 8 inches square shall be cut through said floors, unless properly boxed or framed around with iron.

And such openings shall be filled in with fireproof material after the pipes or conduits are in place.

ROOF DOMES.

Nothing in this section contained shall be deemed to prohibit the construction of the roof domes provided that the materials used therefor are in accordance with those specified in this section, and that the unit stresses do not exceed those fixed in this code, and that in all respects the construction shall be satisfactory to the Commissioner of Buildings.

INCASING INTERIOR COLUMNS.

All cast iron, wrought iron or rolled steel columns, including the lugs and brackets on same, used for vertical supports in the interior of any fireproof building, or used to support any fireproof floor.

Shall be entirely protected with not less than 4 inches of hard burned brickwork, terra cotta, concrete or other fireproof material, without any air space next to the metal, securely applied; but no plaster of paris or lime mortar shall be used for this purpose, nor shall any plaster, whether or not on metal lathing, be considered a part of the covering required.

No single block or unit of insulating material used for column covering shall have a greater vertical dimension than 6 inches when placed in position, nor shall the shells and webs of hollow tile or terra cotta blocks be less than 1 inch in thickness, and these blocks shall be laid up with Portland cement mortar, and the said blocks be suitably tied or anchored together.

The extreme outer edges of lugs, brackets and similar supporting metal may project to within ⅞ of an inch of the surface of the fireproofing.

The fireproof coverings shall start upon the fireproof floors, and continuously extend to the fireproof ceilings or underside of girders above, and be entirely independent of any ornamental base or capital.

No pipes, wires or conduit of any kind shall be incased in the fireproofing surrounding any column, girder or beam of steel or iron, but shall be placed outside of such fireproofing.

Where the fireproof protection of columns is exposed to damage from the trucking or handling of merchandise, such fireproof protection shall be jacketed on the outside for a height not less than 4 feet from the floor with sheet metal, or with vertical strips of oak; and if the oak be used for such purpose the vertical strip shall be sufficiently separated from each other always to show that the woodwork of the guard has been placed entirely on the outside of the fireproof material which incases the metal column.

INCASING EXPOSED SIDES AND BOTTOM AND TOP PLATES AND FLANGES OF GIRDERS AND BEAMS.

The exposed sides of wrought iron or rolled steel girders supporting walls, iron or steel floor beams, or supporting floor arches of floors, shall be entirely incased with hard burned clay, porous terra cotta, concrete or other fireproof material, such incasing material to be not less than 2 inches in thickness.

All incasing material to be securely attached to the girders and beams.

The shells and webs of hollow tile blocks shall be not less than 1 inch in thickness, and shall be laid up with Portland cement mortar, and the said blocks be suitably tied or anchored together.

INCASING INTERIOR COLUMNS AND GIRDERS IN NON-FIREPROOF BUILDINGS.

In all non-fireproof buildings where iron or steel structural members are incorporated in the construction of the building, said iron or steel columns, girders, beams and other structural metal members shall be incased as before described in this section, except that the thickness of such insulating material may be not less than 2 inches.

SKELETON-CONSTRUCTED BUILDINGS.

Where columns are used to support iron or steel girders carrying inclosure walls, the said columns shall be of cast iron, wrought iron, or rolled steel, and on their exposed surfaces be constructed to resist fire by having a roofing of brickwork not less than 8 inches in thickness on the inside surfaces, nor less than 4 inches in thickness on the inside surfaces, and all bonded into the brickwork of the inclosure walls.

The exposed sides of the wrought iron or steel girders shall be similarly covered in with brickwork not less than 4 inches in thickness on the outer surfaces and tied and bonded, but the extreme outer edge of the flanges of beams or plates or angles connected to the beams, may project to within 2 inches of the outside surface of the brick casing.

The inside surfaces of girders may be similarly covered with brickwork, or if projecting inside of the wall they shall be protected by terra cotta, concrete or other fireproof material not less than 4 inches in thickness.

Girders for the support of the inclosure walls shall be placed at the floor line of each story.

The skeleton steel frame of a building shall be independent from that of an adjoining building, and the frame of one building shall not be bolted or riveted in any manner to the frame of any other building.

(To be continued.)

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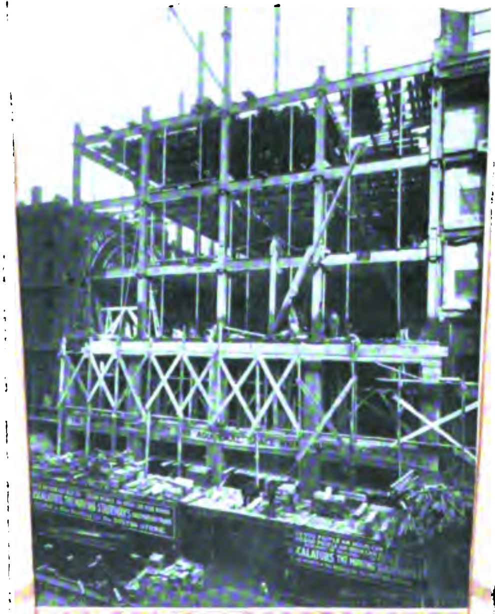

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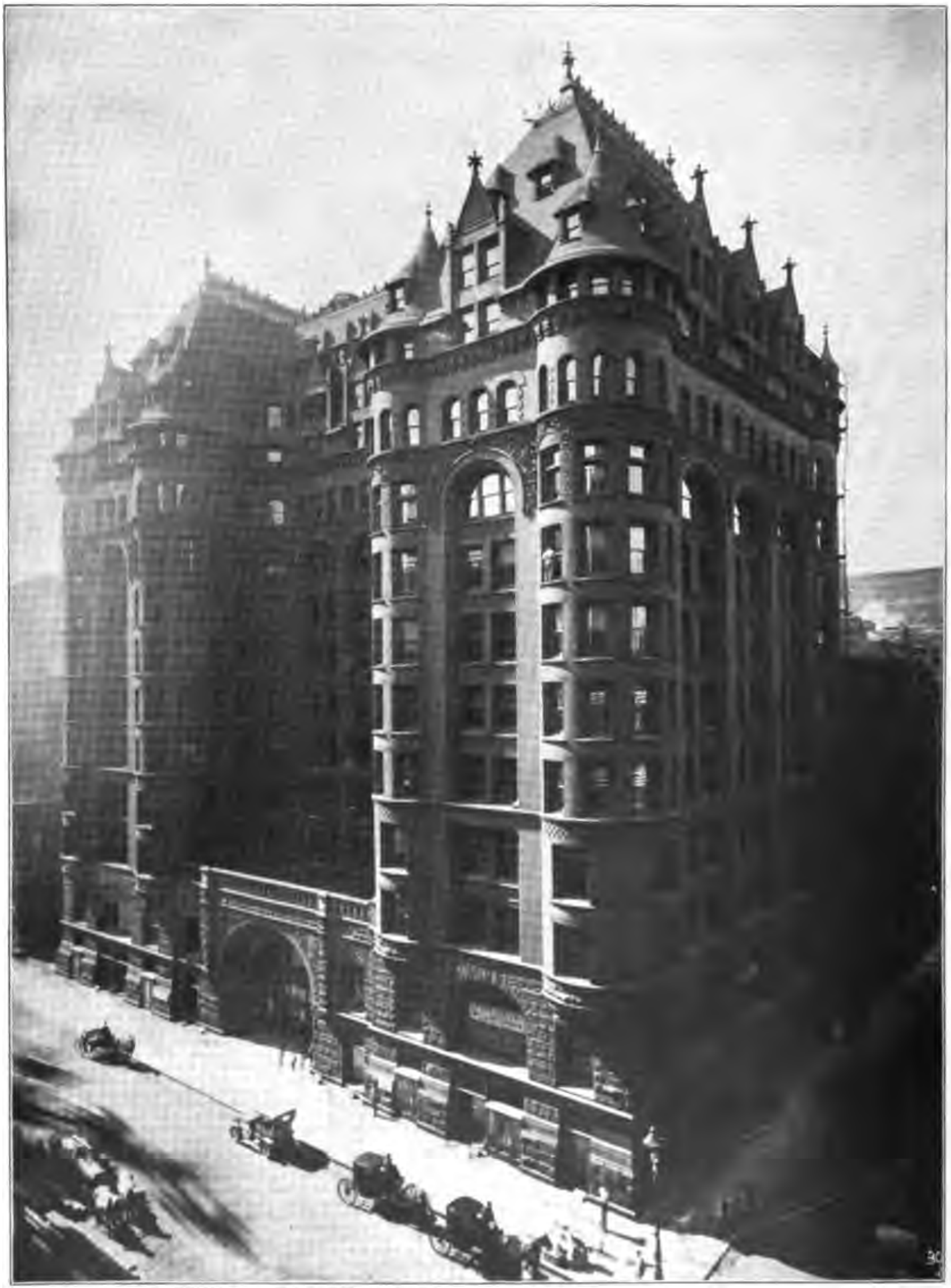

THE TEMPLE, LA SALLE AND MONROE STREETS, CHICAGO.

Burnham & Root, Architects.

This is the last of the great buildings designed by the late John W. Root, built in 1890. The illustration is from the first photograph, taken from a good point of view, especially for Fireproof Magazine, and only possible by the taking down of the opposite building. A model of fireproof construction throughout. Photographed by J. W. Taylor.

FIREPROOF MAGAZINE

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TWO MORE FLOOR COLLAPSES

WE are again called upon to record two more collapses of floor construction in new buildings, one of which was in connection with the use of reinforced concrete and another in which a brick arch system reinforced with T-iron ribs was used, the latter, however, being filled at the haunches with concrete. It seems that very little publicity is given to such events except in the daily papers and this magazine. Following the precedent heretofore established, we will continue to tell the truth about them as far as we can find it out, however regrettable it may be that such things should occur. Had the repeated warnings given in these columns during the last two years been heeded we would be spared the necessity for this. Referring to the use of concrete for floor constructions as such, it is not so much the use of it against which we have given warnings, but its misuse by the introduction of cheap cinders diluents, and especially carelessness in the method of its installation by incompetent cheap labor. The latest failures in floor construction of all kinds seem to be due mainly to the latter cause.

On the 27th of October a collapse occurred in the ten-story building of Lowman & Hanford at Seattle, Wash. We are informed that the building is of steel skeleton construction with floors of reinforced concrete. A welded galvanized wire reinforcement was being used, and a section of concrete on the fifth floor, 15 by 27 feet in size, had been nearly completed when it fell. The corresponding section in the fourth floor had not been put in and the fall from the fifth carried away the third, second and first floors. One account says that four men were carried down in the wreck, of whom two were buried in the debris, and presumably killed, and two were severely injured. Two informants state that the fall was primarily caused by the failure of the bolts used to support the false work from the I-beams. This description accords almost exactly with that given in FIREPROOF MAGAZINE for September of the fall of a floor during construction at Louisville, Ky., upon which we commented at the time.

The other collapse occurred in the new six-story building for Hayden Brothers at Omaha, on Douglass street, between Sixteenth and Seventeenth, on the 6th of

November. Two workmen were buried in the ruins and killed. The floors were constructed in sections 16 by 21 feet between the I-beams, with segment arches of small T-iron, between which hard bricks are set and the whole is covered with concrete to a level surface on top. The I-beams were held together with tie rods. A section of the fourth floor fell while the work was being put in, and in its fall carried down all the floors below it. The accounts differ as to the cause of the accident, and most of them ascribe it to the insufficiency of the tie rods between the I-beams. As after such accidents many tie rods may be found broken, it is natural for those who are not experts to suppose that they failed in the first instance. But there is a possibility that even though such a long-span segment arch may be sufficient when completed, a failure to understand the law of balance during construction might result in collapse. The too rapid filling of concrete on one side of such an arch, combined with severe tamping, might cause the opposite side to rise and thus buckle the arch, the fall of which would be sufficient to break the tie rods. This could be averted by proper care in distributing the load.

It seems that Building Inspector Withnell of Omaha had refused to issue a permit for the construction of the building according to the original plans on account of his objection to this style of construction. He was overruled by a resolution of the city council passed April 4, 1905, directing him to issue the permit, and subsequently he was restrained by an order of court forbidding him to enter the building.

STATE AND MUNICIPAL BUILDING REGULATIONS

HERETOFORE Fireproof Magazine has given considerable space to model laws for building regulation, especially for fireproof building, taken from enactments in force whose provisions appeared to be commendable. These reprints have appeared from time to time for a year past, making this magazine a valuable book of reference for all who are seeking information in that direction. Last month we commenced to reprint those parts of the projected model ordinance of the "Committee of Twenty" of the National Board, relating to fire preventive construction, and this is completed in the present number.

Two responsible and influential bodies are now working for similar results, but the proposed state law prepared by the International Society of Building Commissioners and Inspectors differs somewhat from that of the National Board. It is intended to be enacted by state legislatures and is more general in its requirements. The enactment of state laws like this will not prevent the adoption of local ordinances by municipalities in which the conditions are such as to require more drastic regulations, especially in large cities where the congestion of buildings increases the conflagration hazard. Several attempts have been made to have state fire laws enacted, but they have not been vigorous ones. A brief fire law was introduced in the General Assembly of Illinois four year ago. It received no favor, probably because it was not strongly advocated, and was not reported out.

The proposed state law, with an explanatory introduction by F. W. Fitzpatrick, is printed in this issue. It seems to us that if properly pushed it may be passed during the coming year in several states whose legislatures meet. The large cities which already have ordinances will naturally take no interest in the matter, having already taken care of their own interests under the police powers conferred upon them. But the building commissioners in those cities which have them ought to work for it. A no less important duty devolves upon the representatives of the fire insurance companies, who may be found everywhere. It remains to be seen whether or not they are sufficiently interested in fire prevention, which is the real interest of the companies they represent, to give their time and influence to assist the international society in carrying out this great reform measure. The papers by Alcide Chaussee and F. W. Fitzpatrick in the present issue also have a bearing upon the importance of state and municipal building regulation.

HIGH CLASS FIREPROOF BUILDINGS IN NEW YORK

The necessary connection between fireproof building and artistic architecture is a matter which has not heretofore been considered in these pages. Good architecture is worth preserving and the first essential to its preservation is that it should be fireproof. If fireproof methods of the best kind are used in high-class buildings they are not only fireproof, but they have lasting qualities, are proof against the depreciations which come with wear and tear, as well as the disintegrations which proceed from physical causes. A thing of beauty will not be a joy forever if it is subject to these conditions.

In the present issue we present a description, with illustrations, of the new Tiffany building at New York, by the well-known writer, George E. Walsh. This will be followed by a description of the Gorham building in the January number and the Madison Square Presbyterian Church in the February number, all by Mr. Walsh. These three buildings are by the same architects, McKim, Mead & White. In March Mr. Walsh expects to describe the new Custom House at New York, by Cass Gilbert, and in April the College of the City of New York, by George B. Post. These articles will be monographs and not alone technical descriptions of fireproof methods of building.

ARCHITECTURE OF THE TIFFANY BUILDING—AN APPRECIATION

It is not our purpose to criticize the exterior architecture of the new Tiffany building, which is illustrated in this issue. It is only one of many illustrations of the direction which architectural thought is taking in this twentieth century. If there were no architectural thought in it it would not be worthy of this mention. The firm of McKim, Mead & White is probably the most prominent of the architects of this country at the present time. It is a cohesive firm that has existed for many years, although all its members may still be regarded as young men—young in thought and aspiration, and young enough to still experience its own evolution and to make the impression of its influence upon a future generation of architects. We say *prominent* in the sense that it is best known and most talked about. Architecturally it is a unit and may be spoken of as one man would be, for it contains two men who are recognized artists, are evidently working together from a common impulse, and, as we believe, *with a settled purpose.* It has taken some time to realize this, though it is the result of long observation.

The architectural profession in America is only united in one impulse, and that is to build correctly and scientifically. In artistic design it is all at sea. It is evident that we are in a transition period and know not what is in store for us. During the last half century the architects have been filled with erudition. They now know all that has been done and yet are uncertain what to do when it comes to the designing of a building. Most of the revivals and most of the fashions have had their day. Only the French fashion lingers with us, and that principally in the eastern cities, though it is gradually being thrown to the winds in France. At present almost anything "goes" except ancient Egyptian and the Oriental styles.

The architects here referred to are, as we have said, artists, and once upon a time their work was remarkable for orignality and beauty. Then a change came, and it is evident that they concluded that they were not destined to originate a style of their own. Neither did they accept any of the prevailing fashions or fall into the French fad. Much less did they cling to or try to reproduce any ancient style or evolve anything from either of them. Yet their opportunities for this were probably greater than those afforded to others. They occupied a position of absolute professional independence with their clients, who placed implicit confidence in them. And how was this independence availed of?

They simply utilized their great knowledge of the best works of the past by reproducing them as far as they could adapt them to the exigencies of the present. Thus they have been able to reproduce, not as servile copyists, but with a spirit akin to that which actuated the original producers, and with an exquisite sense of appreciation in making the selections, some of the finest works of olden times. These were mainly found in the period called the Renaissance in Italy. And that is why we have before us in the Tiffany building a revival of the front of the Palazzo Grimani of Venice. In scale it is probably magnified four times. To some it may appear as a deceit—the attempt to make a six-story building look like one of three stories. If it were an entirely original design that charge would be justified. Judged by the standard of the so-called Italian authorities of the sixteenth century, it is all wrong, because it repeats a historical order three times. But for all that the echo of the Grimani palace still stands before us as a work of art.

What the influence of this method will result in remains to be seen. It can only be said that it is a safe course which few others are blessed with the ability to follow. But it is honest.

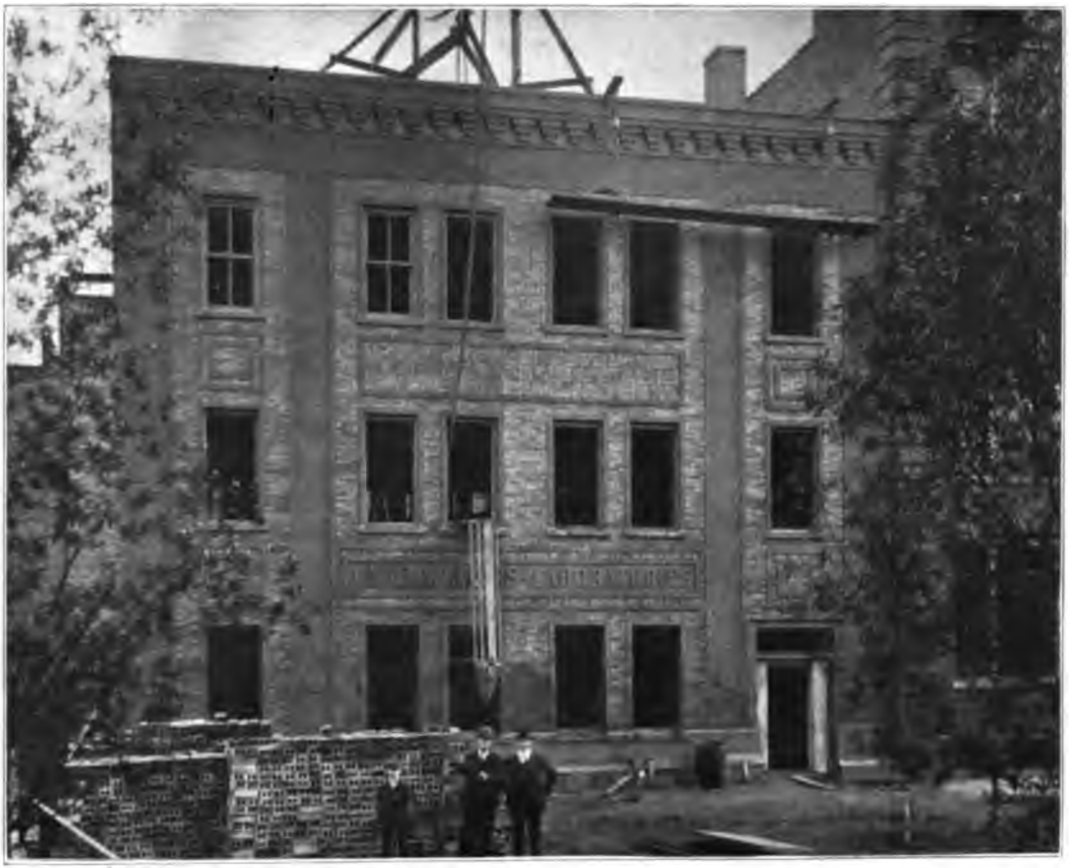


FIG. 1—NEW UNDERWRITERS' LABORATORIES, CHICAGO—FRONT VIEW.
Argyle E. Robinson, Architect.

THE NEW UNDERWRITERS' LABORATORIES, CHICAGO

BY PETER B. WIGHT.

WHEN the National Board of Fire Underwriters had discovered that the valuable work undertaken by it in recent years required larger and better quarters than those which it had occupied, it decided to erect a new plant. The plant formerly used as an Underwriters' Laboratory and Experiment Station had not been built for the purpose, the work already accomplished had proved to be of great importance, and there was no doubt that the institution had proved that its mission was a permanent one. Accordingly a lot was leased at 382-4-6-8 Ohio street, north of the Chicago river and within convenient walking distance from the business center of the city, and plans for the building were prepared. At first it was contemplated to make the building an example of slow burning mill construction and the first plans made provided for this method of building. The words "slow burning mill construction" are entirely out of place when employed in connection with the building ordinance of Chicago, and are here used in the same sense as by the New England Mutual Mill Underwriters. They call unprotected timber construction, supplemented by automatic sprinklers "slow burning." The Chicago ordinance calls

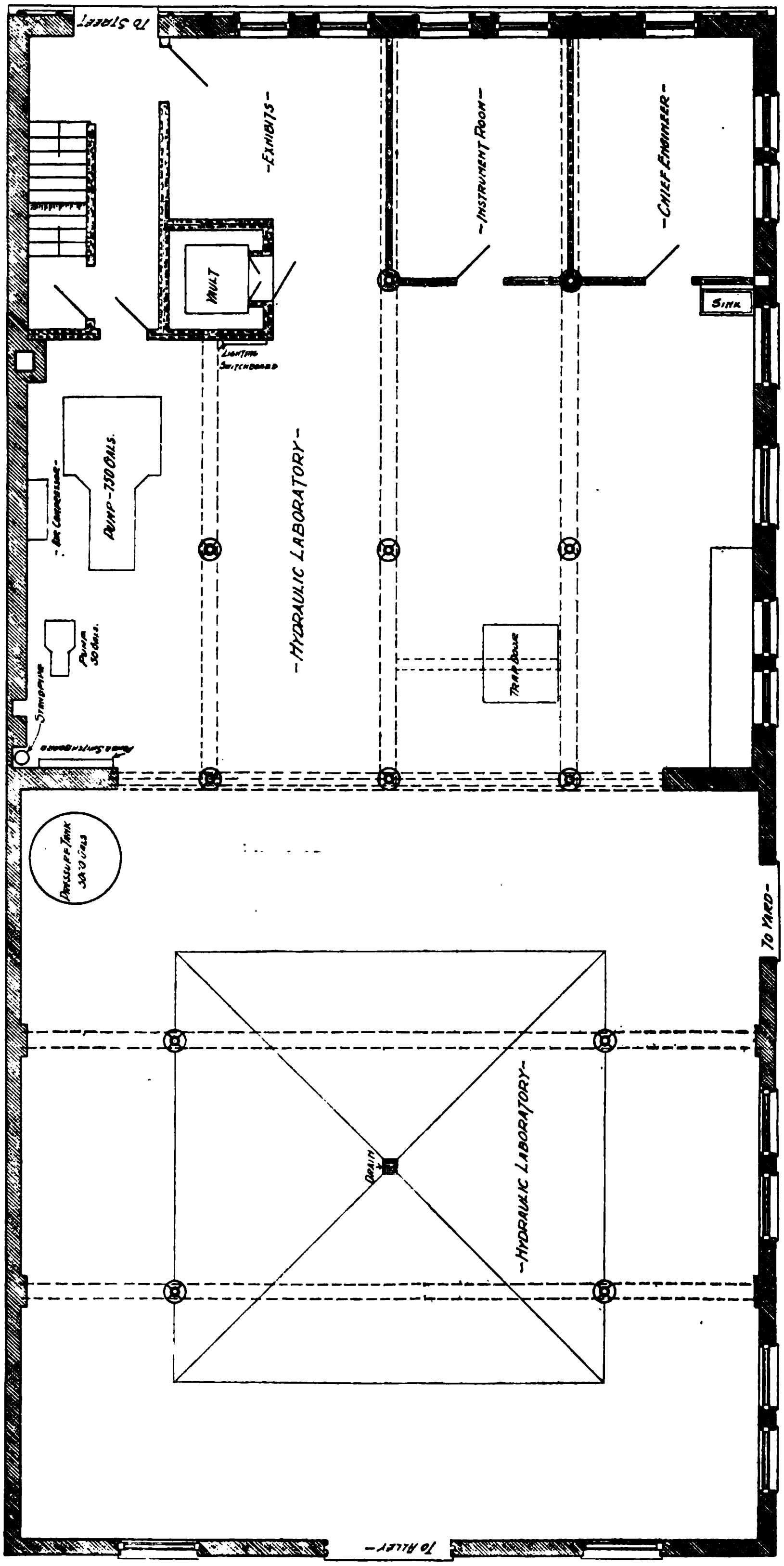


FIG. 2—GROUND FLOOR OF UNDERWRITERS' LABORATORY.

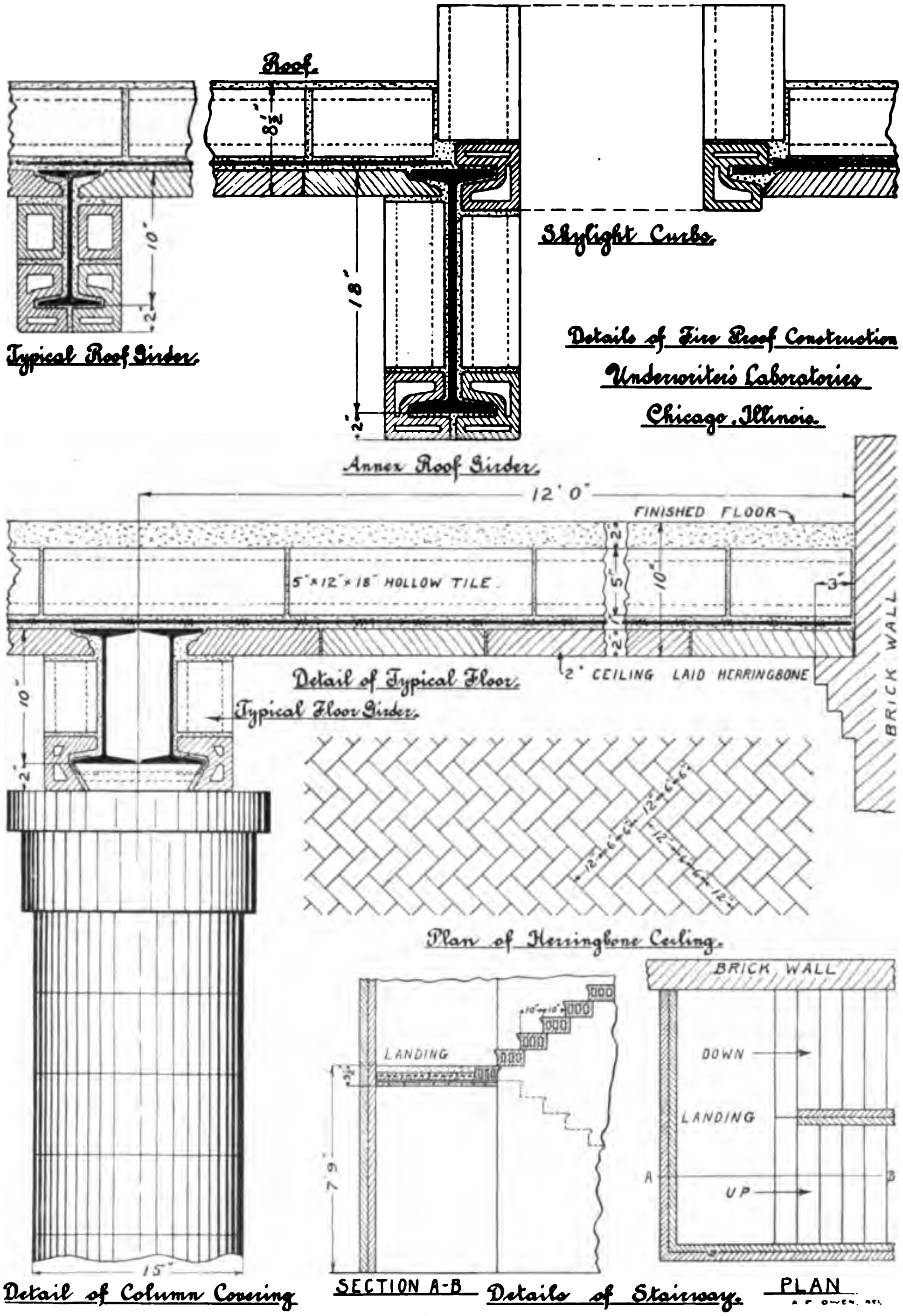

Roof.
8½"
10"
2"
Typical Roof Girder.
Skylight Curbs.
18"
2"
Details of Fire Proof Construction
Underwriter's Laboratories
Chicago, Illinois.
Annex Roof Girder.
12' 0"
FINISHED FLOOR
5"×12"×18" HOLLOW TILE
2"
5"
10"
2"
3"
BRICK WALL
Detail of Typical Floor.
2" CEILING LAID HERRINGBONE
Typical Floor Girder.
10"
2"
12"+6"+6"
12"+6"+6"+12"
Plan of Herringbone Ceiling.
LANDING
10"×10"
7' 9"
BRICK WALL
DOWN
LANDING
A
B
UP
15"
Detail of Column Covering
SECTION A-B
Details of Stairway.
PLAN
A. F. OWEN, DEL.

FIG. 3.

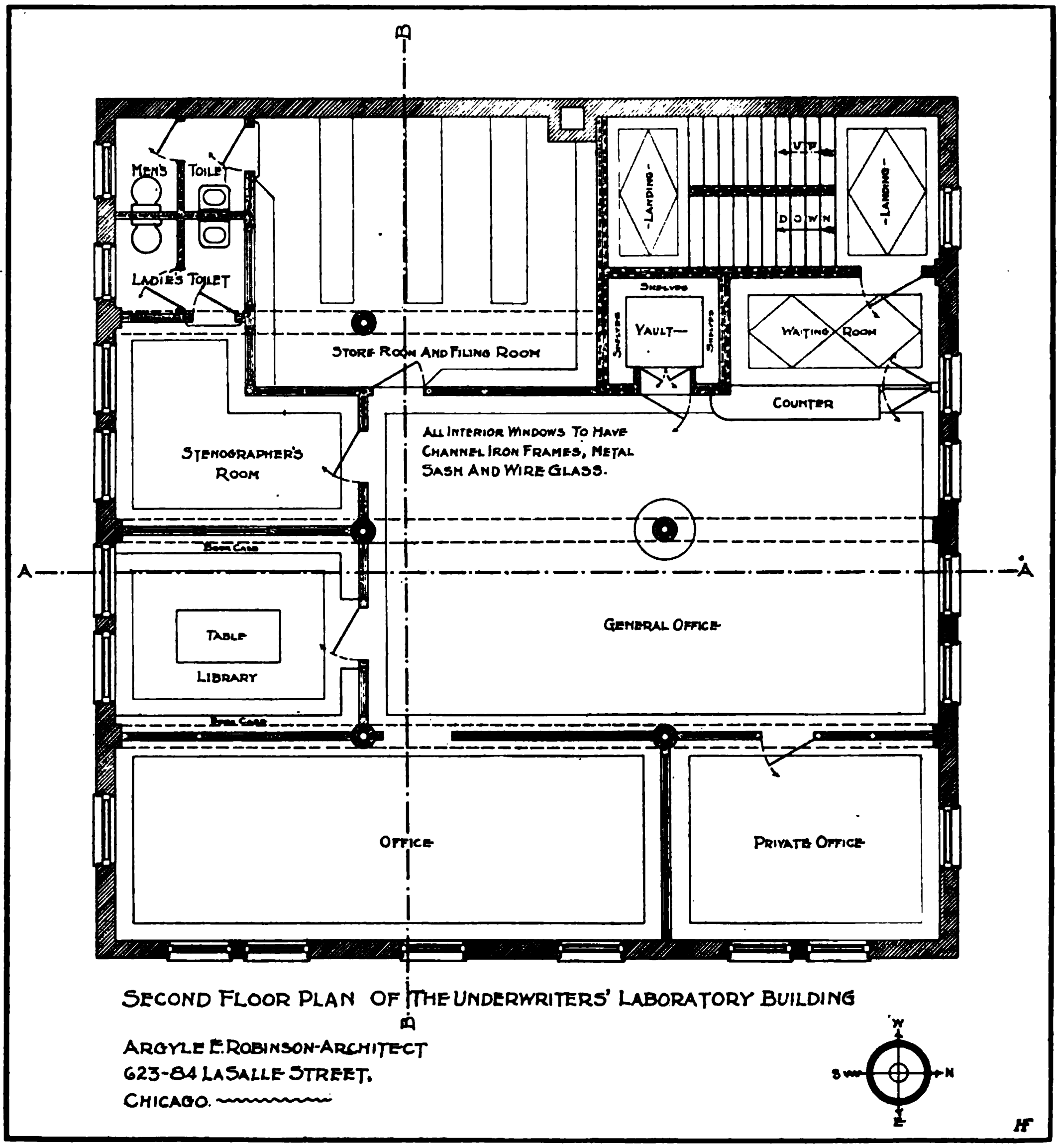

B
Men's Toilet
Ladies' Toilet
Store Room And Filing Room
Landing
Up
Down
Shelves
Vault
Waiting Room
Counter
All Interior Windows To Have Channel Iron Frames, Metal Sash And Wire Glass.
Stenographer's Room
Book Case
A
Table
Library
General Office
Office
Private Office
Second Floor Plan Of The Underwriters' Laboratory Building
Argyle E. Robinson-Architect
623-84 LaSalle Street,
Chicago.
W
S
N
E
HF

FIG. 4.

this only "mill construction" and calls the same "slow burning" construction only when covered, where exposed, with metallic lath and plaster, tiles or any other non-combustible material.

But on a second and wise thought the National Board changed its plans and concluded to make the building a model of fireproof construction and incombustible finish. The plans were redrawn by the architect, Argyle E. Robinson of Chicago, and to use a cant expression, we might add that no pains were spared to attain that result. But such words might apply to many other buildings contemporaneously erected. The representatives of the board did much more. Mr. W. H. Merrill, Jr., the secretary, in charge of the laboratories, and Mr. Robinson, the architect, immediately began an investigation in order to discover how to make the building a model of all that the Underwriters' Laboratory had been established to demonstrate, so far

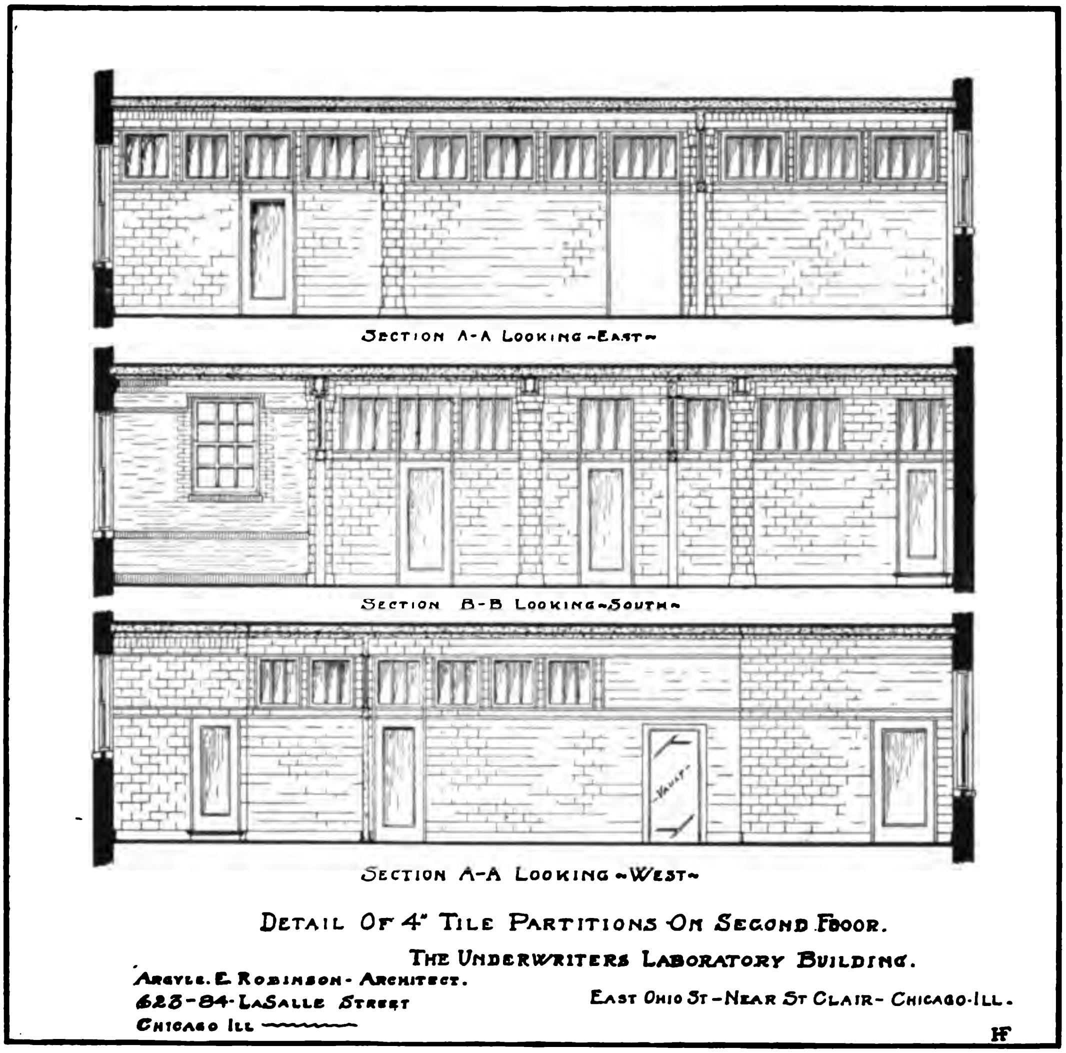

Section A-A Looking -East-
Section B-B Looking -South-
Vault
Section A-A Looking -West-
Detail Of 4" Tile Partitions On Second Floor.
The Underwriters Laboratory Building.
Argyle. E. Robinson - Architect.
623-84-LaSalle Street
Chicago Ill
East Ohio St - Near St Clair - Chicago-Ill.
HF

FIG. 5.

as building construction and finish are concerned. The building was to be only three stories in height, with a basement, and hence steel skeleton construction was not necessary. So it was decided that the exterior walls should be of the best hard burned brick, inside and outside; that protected cast-iron columns should be used to support steel girders and beams for the floors and roof, the latter of course protected; that there should be no attic, but that the ceiling of the third story should be the roof; that all floor and roof construction partitions, column and beam protection should be of semi-porous hollow terra cotta with thick walls, and that all openings in the hollow tile partitions should be framed with rolled channel steel framed together, which should be the final finish around the same. It was also decided that there should be no plastering in the building and that all the floors should be finished with cement. Furthermore, that all window frames, skylights and sash should be of the various manufactures using sheet metal which had been tested in the laboratory and that all glass should be Mississippi wired. All doors also should be of double copper or steel and filled, and, in fact, that no combustible material should enter into the finish or furnishing of the building.

For floor construction it was decided to use the Johnson tension system. But instead of using it with cement ceilings, as has often before been described in these pages, the ceilings are all of 2-inch porous tiles. These tiles are set directly on the straight board centering, in herringbone fashion, and form the finished ceiling. The method of setting them is shown in Fig. 6. In Fig. 3 they should have been shown with grooves in the edges. Between these grooves metallic clips are set, which are secured to the tension material of steel wire fabric, before the coat of cement is spread. The tension material covers each floor from wall to wall, bearing on the girders where it crosses them. A thick coat of cement completely embeds the steel fabric and in this are laid the 5 by 12 by 18 inch hollow semi-porous tiles, which are thus cemented to the ceiling tiles (see Fig. 7). The five-inch tiles are in compression in this construction. The ceiling tiles in combination with them are part of Mr. Johnson's original invention. They have no hollow spaces and would have to be destroyed before the floor construction could in any way be affected by fire. The exposed joints in the ceiling tiles were raked out after the centering was struck, as shown in Fig. 9, and then carefully pointed.

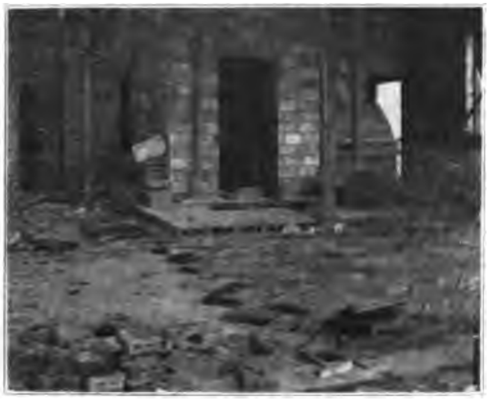


FIG. 6—LAYING CEILING CONSTRUCTION. Straight centering in place and ceiling tiles being set.

All the floors were covered with a rough coat of cement which filled the vertical joints between the 5-inch tiles, and afterward finished with a smooth coat of cement. The roof was finished with felt and gravel over this.

The detail drawing of the steel and fireproof work, shown in Fig. 3, is so graphic as hardly to need further explanation. It is worthy of careful study by all who desire to introduce the most thorough and perfect protection in buildings constructed with iron and steel. In the lower right-hand corner of the same is seen a plan and section of the stairway extending from first to third story. The landings are constructed in the same manner as the floors. The steps are each in a single piece of hollow terra cotta made by forcing the clay through a die in the same manner as fireproof tiles. The steps have molded nosings, are of smooth finish and the tops and bottoms are equally prominent after setting. Each stairway is four feet wide in the clear. On the outer or wall side the steps are built into the pressed brick

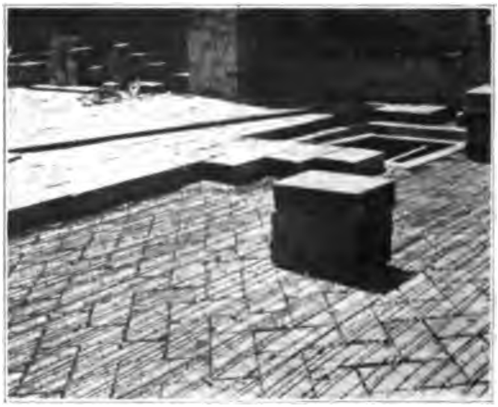


FIG. 7—LAYING FLOOR CONSTRUCTION. Tension for brick laid over ceiling tiles and structural tiles partly set.

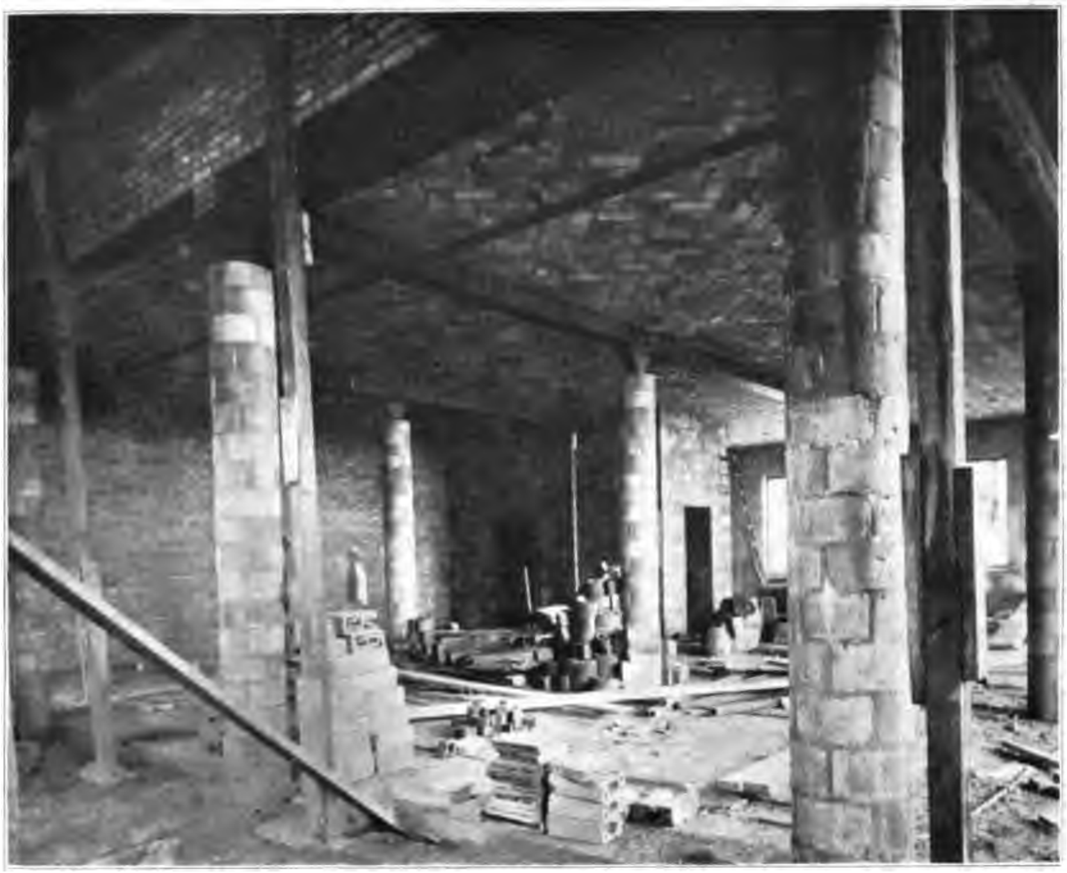


FIG. 8—NEW UNDERWRITERS' LABORATORIES, CHICAGO.
View in first story during construction.

facing of the wall, and in the center between the flights they are built into double partitions of hollow tile, so that there are no balustrades or railings. A picture of part of a completed stairway is seen in Fig. 11. All joints in the hollow tile work on stairway and wherever exposed were carefully raked out and pointed after this picture was taken. The brick walls on all stairways are faced with hard red pressed bricks. The same face bricks are used on the brick walls of the second story, the whole of which is used for office purposes.

Attention is directed to Figs. 2 and 4, where it will be seen that the partitions around the stairway and vault are all double. They are built with two thicknesses of 3-inch hollow semi-porous tiles, which makes them 6½ inches thick. Thus they are built to a line on both sides. It will be seen that the vault partition running from basement to roof carries the double I-beam girder on each story.

The second-story floor is finished off smooth with a material called "Endolite" and all the rooms have bases of the same material made in slabs of 1 by 6 inches, and set like a marble base. These slabs are made to look very brilliant by the insertion of crushed shells and gypsum, and have polished surfaces. They are the only suggestion in the building of anything having been done for ornamental effect.

The front of the building (Fig. 1) is faced with paving brick of a dark color and showing the effects of vitrefaction. Bright red bricks are used in the front which produce an admirable effect

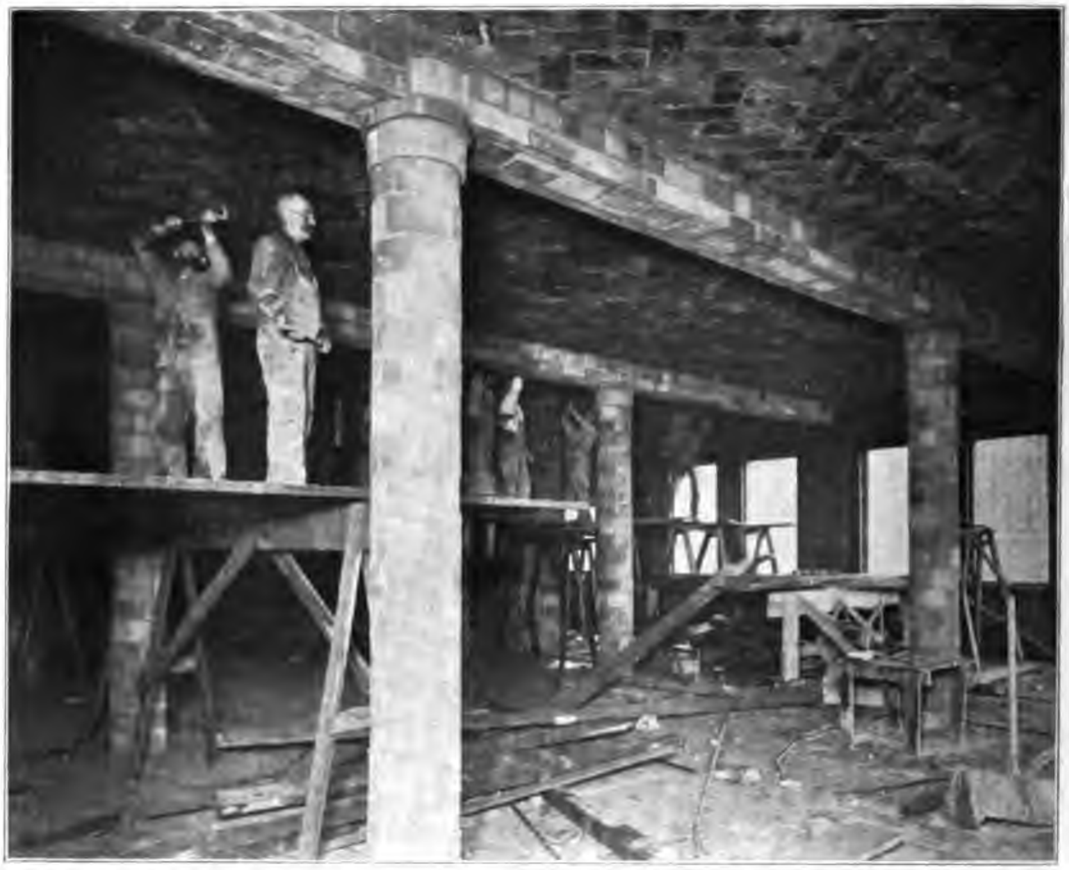


FIG. 9—NEW UNDERWRITERS' LABORATORIES, CHICAGO.
View in second story. Men pointing joints in ceiling.

of contrast, and this is heightened by a judicious use of hand-molded terra cotta in bright red and chocolate tints.

Thirteen different kinds of window frames and sash are used in the exterior and interior openings, all glazed with wired glass. These are from the following makers:

Voigtmann & Co., Chicago.

Knisely Brothers, Chicago.

Harry C. Knisely Company, Chicago.

Sykes Steel Roofing Company, Chicago.

Miller Brothers, Chicago.

Perkinson & Brown, Chicago.

David Lupton Sons' Company, Philadelphia.

W. H. Mullins, Salem, O.

Rasner & Dinger Company, Pittsburg, Pa.

St. Paul Roofing, Cornice & Ornament Company, St. Paul.

J. S. Thorn, Philadelphia.

E. B. Badger & Sons Company, Boston, Mass.

Thomas Lee, Cincinnati, O.

The main entrance door is of copper and made by Knisely Brothers, Chicago.

The rear door of the shipping room is known as the Kinnear rolling shutter. Other doors are the "Richardson," by the Fireproof Door Company, Minneapolis, and the Dahlstrom, by the Dahlstrom Metallic Door Company, Jamestown, N. Y. All furniture used in the building is made of steel by the Art Metal Construction Company, Jamestown, N. Y.

Other interesting details of the work will be seen by reference to the illustrations herewith. Fig. 2 is a general

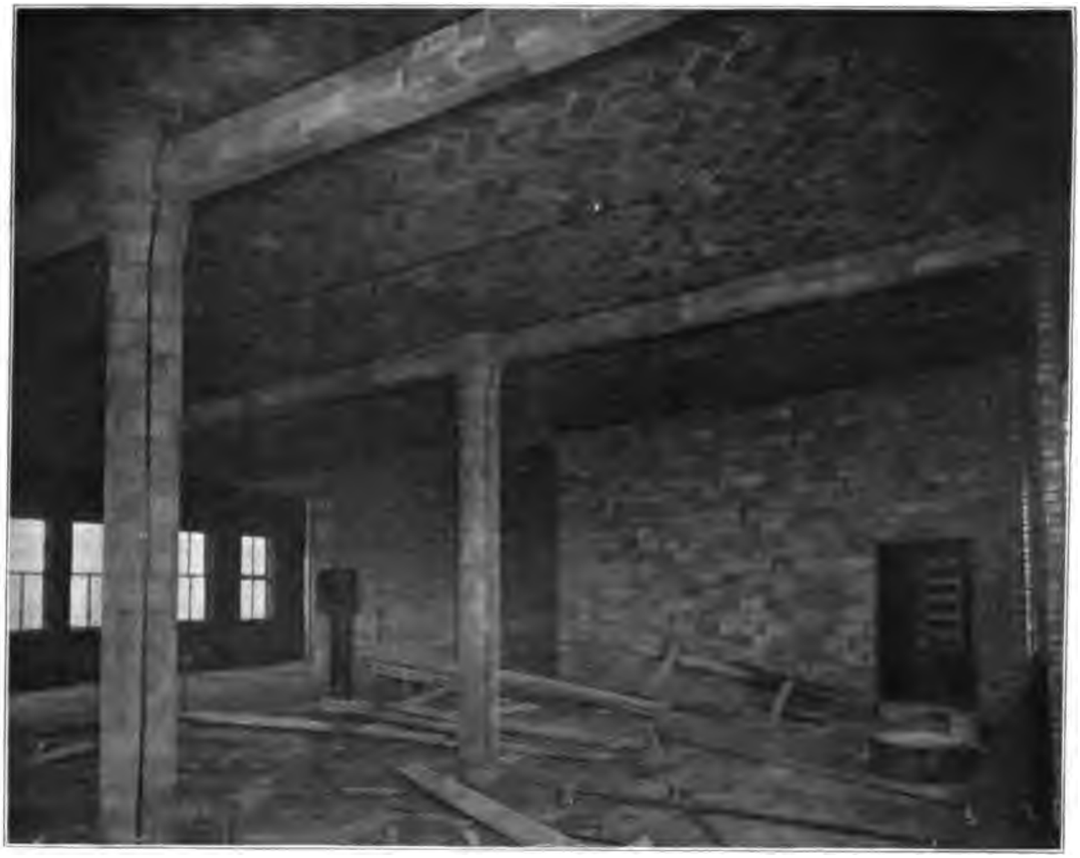


FIG. 10—NEW UNDERWRITERS' LABORATORIES, CHICAGO.
View in third story—joints pointed.

ground plan of the first story, of which the rear extension is only one story high. Here tests are made with sprinklers, acetylene generators, etc. The open yard on the east covers the same area as the building. Here will be located the huts for fire tests, provided with connections for using city gas.

Figure 4 shows a plan of the second story, which is used entirely for business offices and contains a vault with double door. In this story may be seen the construction of 4-inch hollow tile partitions, in which are numerous doors and windows which serve as models for imitation in all office buildings. These partitions are shown in elevation in Figure 5.

In Figure 8 may be seen the setting of the protection to the steel work, which has been only partially completed. The view is taken from the one-story extension looking toward the front.

A complete system of the most improved automatic sprinklers will soon be installed, more for illustration than protection. They are hardly necessary for the latter.

The following information about the objects, uses and administration of the Underwriters' Laboratories has been kindly furnished by W. H. Merrill, Jr., the secretary:

"These laboratories are under the direction of the National Board of Fire Underwriters. They are supported by the stock fire insurance companies doing business in the United States, are engaged exclusively in experimental work in fire protection engineering and testing of devices and materials having a bearing on the fire hazard. This plant is the only thing of the kind in the world and has grown to its present size and importance from a beginning made ten years ago in the establishment by the Western Insurance Union and the Chicago Underwriters' Association of a small room for testing electrical fittings on the second floor of one of the insurance patrol houses in Chicago.

"The lot on which the plant is situated measures 100 by 100, one-half of it being covered by the building and the remaining space, 50 by 100, being reserved for yard purposes and for the erection of ovens for testing fire doors and shutters, floors, partitions and large subjects of this character.

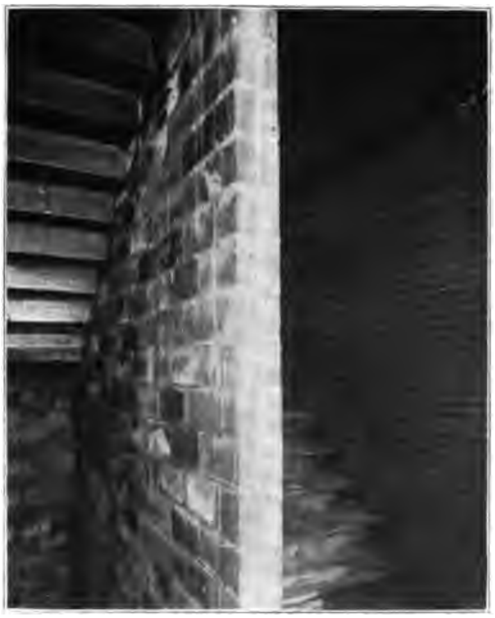


FIG. 11—THE HOLLOW TILE STAIRWAY AND SUPPORTING PARTITION.

"This 10,000 square feet of land has been leased by the Laboratories' Corporation for a period of ninety-nine years. It covers 100 feet street frontage on Ohio street and extends 100 feet in depth to a shipping alley between Ohio and Superior streets. The location is north of the main branch of the Chicago river, is about 15 minutes walk from La Salle street and is reached by electric and cable cars. This central location was judged necessary not only for easy access from the business district, but to secure connections of large capacity for supplies of electric current, gas and water essential in the laboratory work. It also insures prompt delivery of shipments by express and freight from manufacturing plants in all sections of the country.

"The present officers and staff of the Laboratories are: President of the corporation and chairman of the board, Henry Clay Eddy of Chicago, resident secretary Commercial Union and Palatine Insurance Companies.

The Board of Directors—The President and John H. Washburn of New York, president National Board of Fire Underwriters; J. Montgomery Hare, New York, chairman executive committee, National Board of Fire Underwriters; Uberto C. Crosby, New York, chairman committee on lighting and heating, National Board of Fire Underwriters; Charles A. Hexamer, Philadelphia, president, National Fire Protection Association; Christopher M. Goddard, Boston, secretary, Underwriters' National Electric Association; A. J. Harding, Chicago, manager, western department, Springfield Fire and Marine Insurance Company; S. A. Rothermel, Chicago, secretary, Traders Insurance Company; J. M. Neuburger, Chicago, manager, Atlas and Manchester Insurance Companies; Chas. H. Barry, Chicago, manager western department, Pennsylvania Fire Insurance Company; Henry W. Bush, Chicago, associate manager, western department, Fire Association of Philadelphia.

Secretary of the Corporation—W. H. Merrill, Jr.

The Engineering Staff—William C. Robinson, chief engineer; Prof. Fitzhugh Taylor, hydraulics; H. W. Foster, chemicals, gases and oils; Arthur M. Paddon, electricity.

"This organization, upon the efficiency of which the insurance interests largely depend for correct estimates of the value of fire extinguishing appliances and fire resistive materials and methods of construction, as well as for correct methods of safeguarding as far as practicable lighting and heating devices, has enjoyed up to the present time the cordial support and co-operation of the manufacturing companies interested in the construction of wares of this character, and as it retains in its new home the staff and governing boards which have been principally responsible in its upbuilding it is expected to continue its progress and become in the future even more of an important factor for the general good of legitimate manufacturing enterprises, insurance companies and the insuring public."

THE TIFFANY FIREPROOF BUILDING, NEW YORK CITY

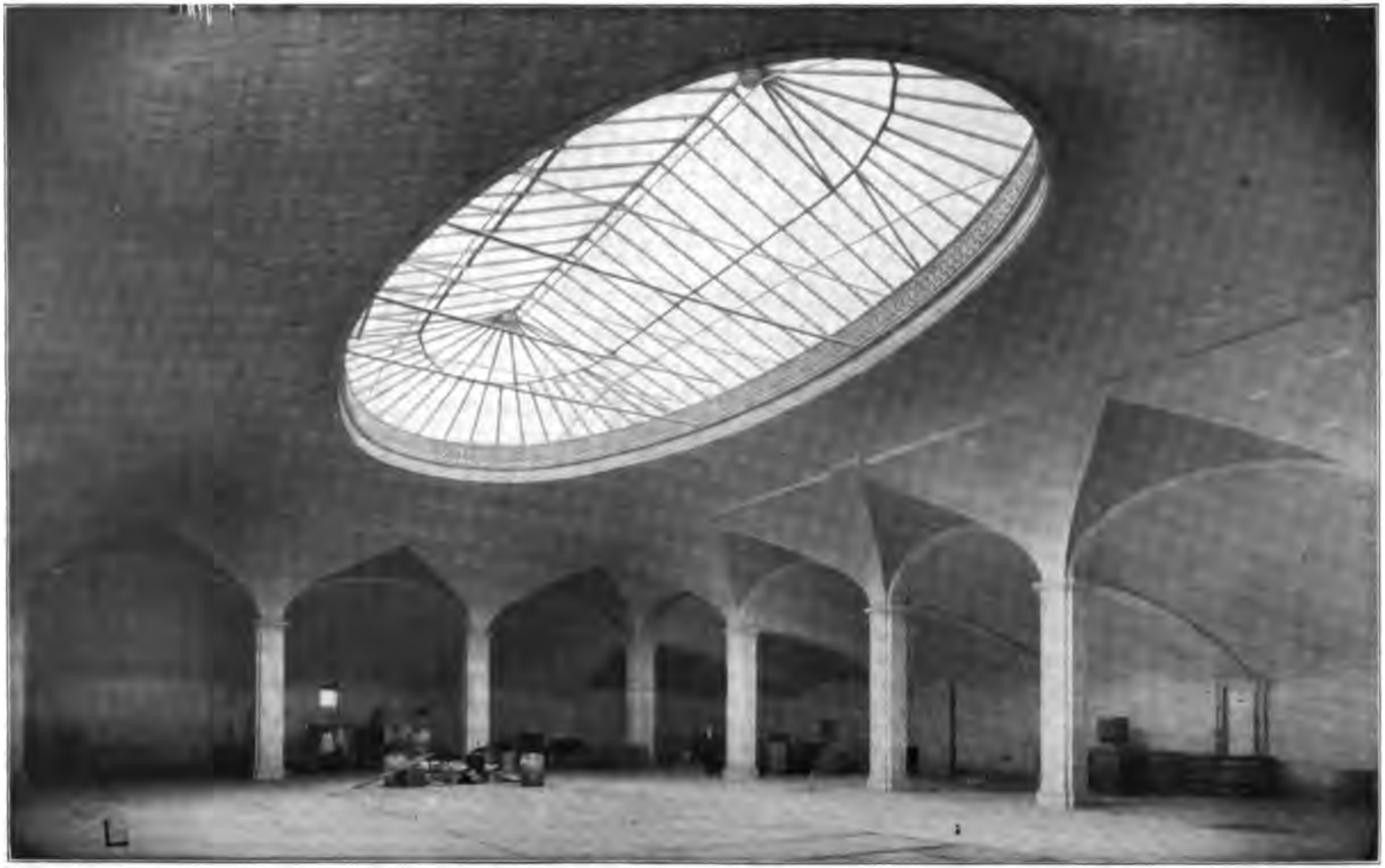
BY GEORGE E. WALSH.

THAT architects of the better class are availing themselves more generally of modern fireproof products for building substantial structures in our large cities is evidence of the important changes that are taking place in building circles. Utility cannot alone be considered by an architect; he must combine the artistic and ornamental with the useful. Wood and stone have so long been the materials for building that many architects seem possessed with the idea that, in the interests of art, life and property must be sacrificed to the risks and dangers of fire. The stubborn persistence with which some have clung to this idea may account for the slow growth of fireproof buildings in certain sections of the country.

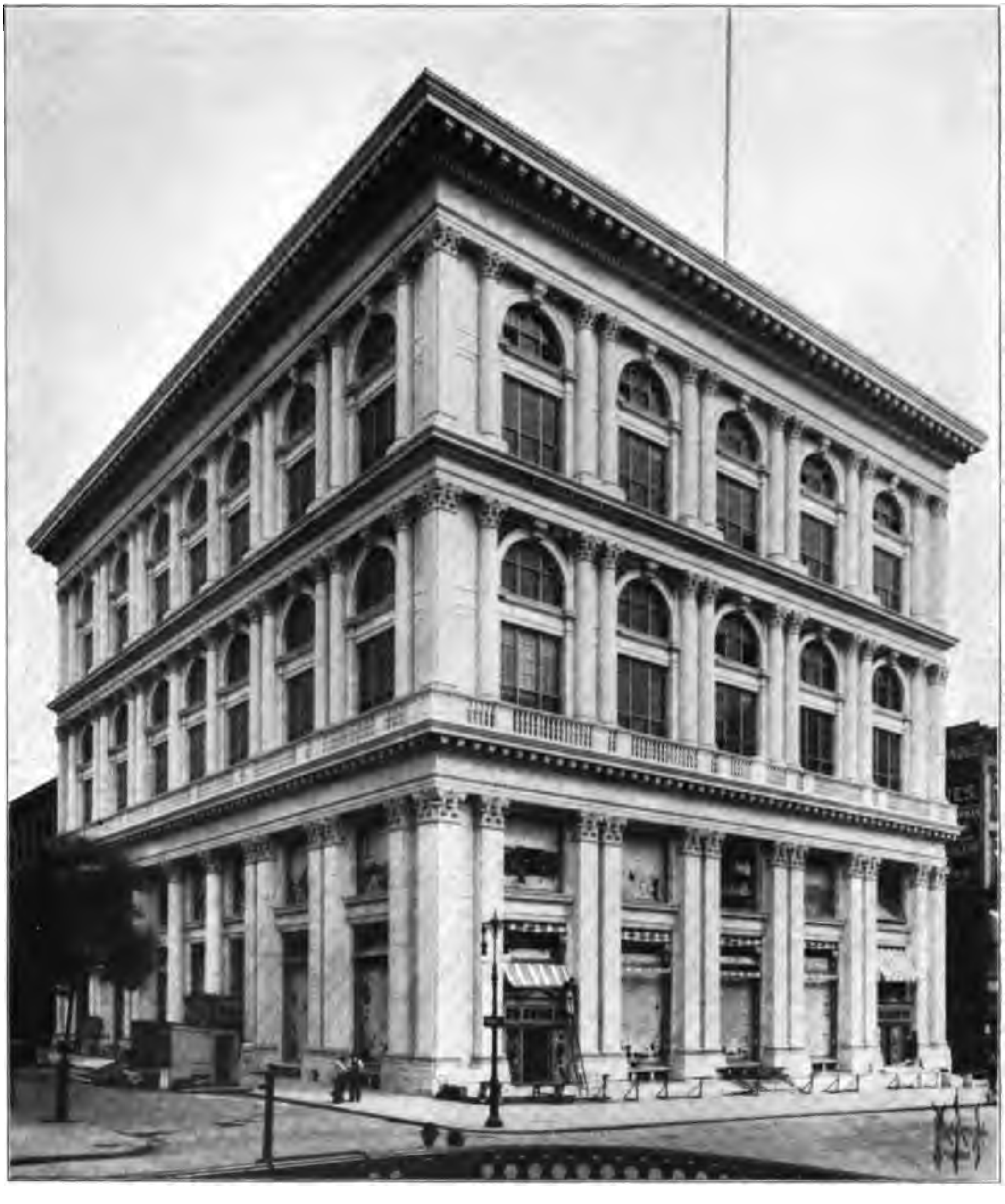
But there is a new art—a new architecture—that has sprung into existence. It is an art that has wrought beauty out of the useful, and made harsh and ugly lines simple, attractive and proportionate. With fireproof bricks, tiles and terra cotta for its materials it has made great commercial buildings—built primarily for utility—monuments of lasting beauty and classic taste. The ungainly skyscraper may for a time have monopolized attention and threatened the architectural features of our great cities; but, accepting the situation as a necessary part of our modern life, architects first sought to soften the straight, angular lines of the tall buildings, and then to design them with true artistic worth. The new architecture has chosen for its field the development of a class of tall fireproof city buildings which will possess all the merits and commercial value of the ugly structures or those built of flimsy material, and yet be architecturally perfect and meritorious.

Typical of the very best in this line are a number of structures in New York which have recently been completed. As illustrating some of the most original features and designs of the modern artistic fireproof building of the highest class, mention should be made of the new Tiffany building, Gorham building and the new Madison Avenue Presbyterian Church. The same architects are responsible for all three creations. It is fitting that one of the oldest and foremost firms of architects, whose work is favorably known in all parts of this country, should have taken up this venture of harmonizing the two aims of all builders and architects. In designing the new Tiffany building on Fifth avenue and Thirty-seventh street the problem of the architects, Messrs. McKim, Mead & White, was somewhat simplified by the cost and nature of the building. It was not proposed to run up a skyscraper or tall office building, but a solid, substantial structure, absolutely fireproof and burglarproof, and artistic in every detail that money could secure. Several million dollars were invested in the land and structure.

The building plot was 117 by 152 feet in size, and contained approximately 17,784 square feet. The building was to be seven stories high, with absolutely fireproof walls in the rear and on the side facing abutting property. The cost was no hampering problem. As a great storehouse for art and valuable gems it was essential that the interior as well as the exterior of the struc-



TIFFANY BUILDING, NEW YORK CITY. McKIM, MEAD & WHITE, ARCHITECTS.
Guastavino construction of exhibition room with enameled tile finish.

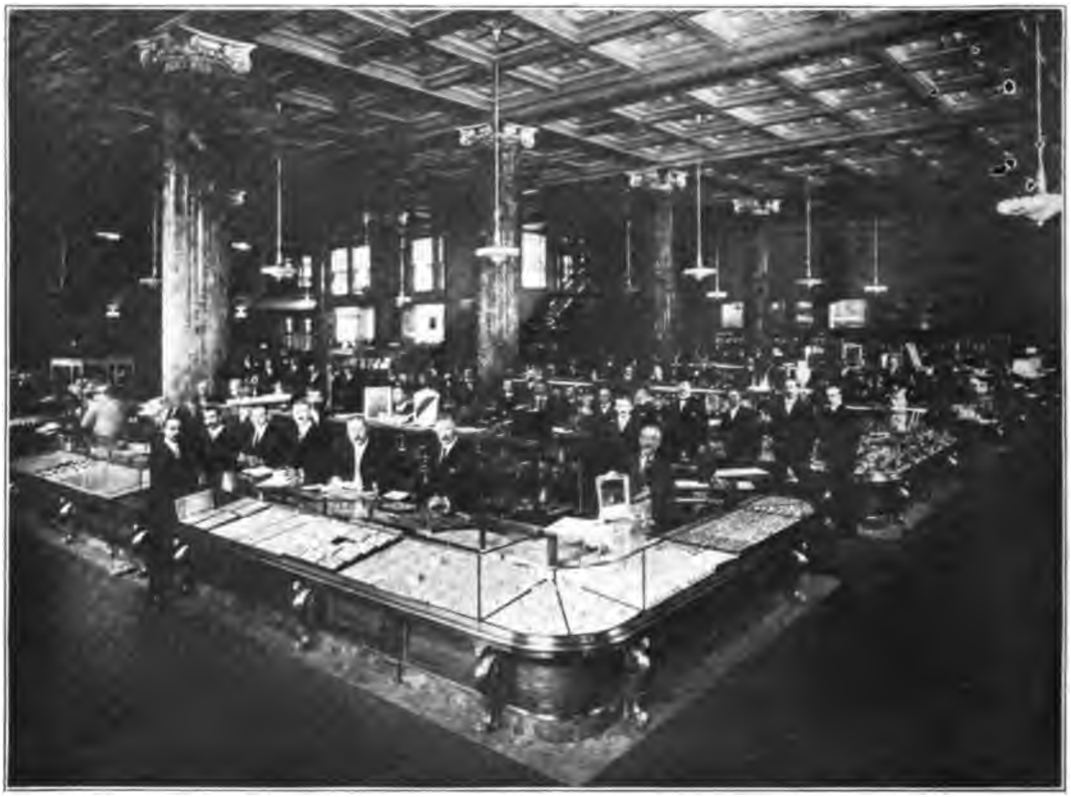


TIFFANY BUILDING, NEW YORK CITY. McKIM, MEAD & WHITE, ARCHITECTS.

ture should be fireproof and at the same time artistically beautiful and proportionate.

The architects have worked out their problem so well that for many years to come the Tiffany building will be a model of what skill and merit can do in harmonizing the modern fireproof materials with the highest in art. The structure is so substantially built that it will last for centuries, and with all fire risks removed there is no earthly reason short of an earthquake why the building should not prove a profitable investment a century or two from now.

With an excellent corner site on Fifth avenue the architects had the opportunity to make their design more proportionate

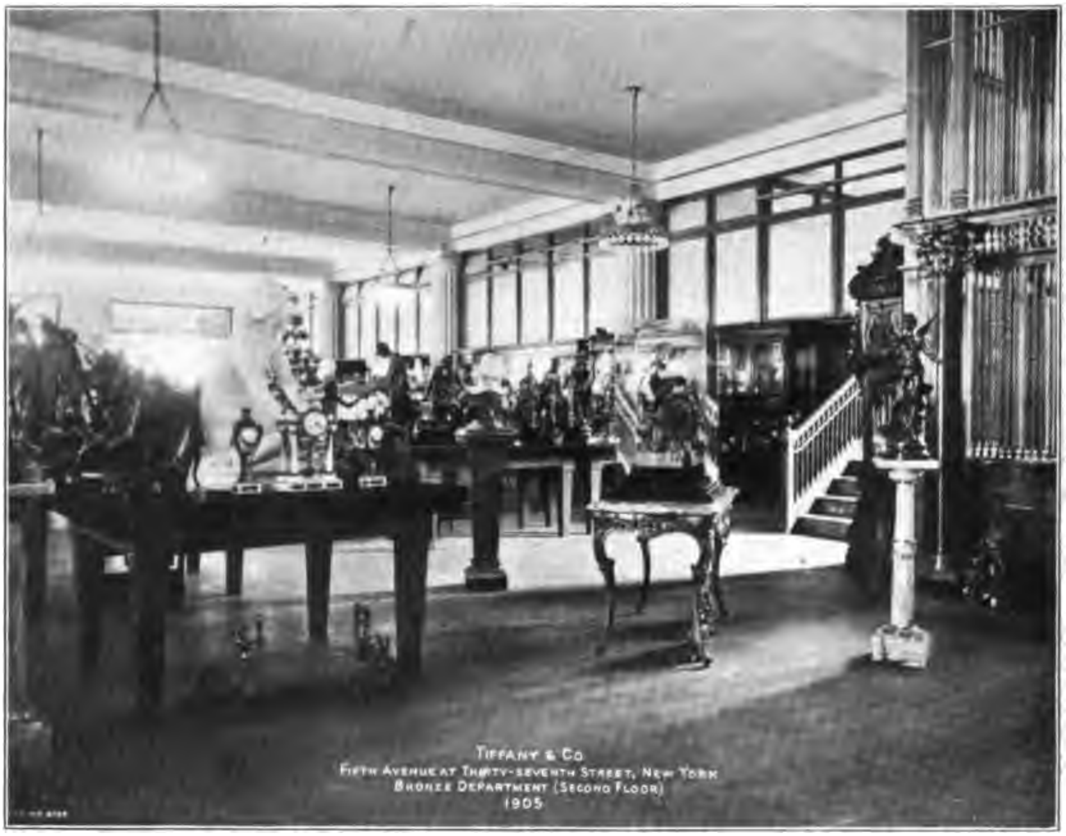


TIFFANY BUILDING—DIAMOND AND SILVERWARE DEPARTMENTS, FIRST FLOOR.

in appearance than if inclosed on both sides by less pretentious structures. Tiffany's famous "fire wall" on his old building had saved him from several threatened fire losses, and the architects have repeated this wall on two sides, with many improvements, but in such a way that its presence could never be suspected. In short, no part of the fireproofing has in any way obtruded upon the beautiful lines and ornamental effects of the building. The fireproofing has been treated as the essential foundation of the building, and then the ornamental features have been developed on broad, classic lines.

The shell of the entire building is constructed of structural steel, with solid concrete foundations, and every vulnerable point protected by fireproof clay tiles and porous terra cotta. The smallest possible amount of wood has been used, but in the interior decoration of the retail part of the store the counters, trim and parts of the floor are finished in mahogany and Philippine teak.

With special reference to the fire risk the architects have introduced some novelties that are of special importance. One of these is the use of what is known as the Guastavino arch. This system of ceiling construction is adopted in the top and underground floors. The domed arches of the Guastavino system consist of clay tiling artistically embedded in plaster for the first course and Portland cement for remaining courses, with the joints raised a fraction of an inch. The tiles used for the ordinary ceiling arch are 6 by 12 inches in size, and have a crushing strength upward of 2,000 pounds to the square inch. The raised joints produce a finished and artistic effect. The arch is carried on iron columns for support. But the careful construction of the dome with the tiling gives rigidity and strength sufficient for huge domes when no iron or


Tiffany & Co
Fifth Avenue at Thirty-seventh Street, New York
Bronze Department (Second Floor)
1905

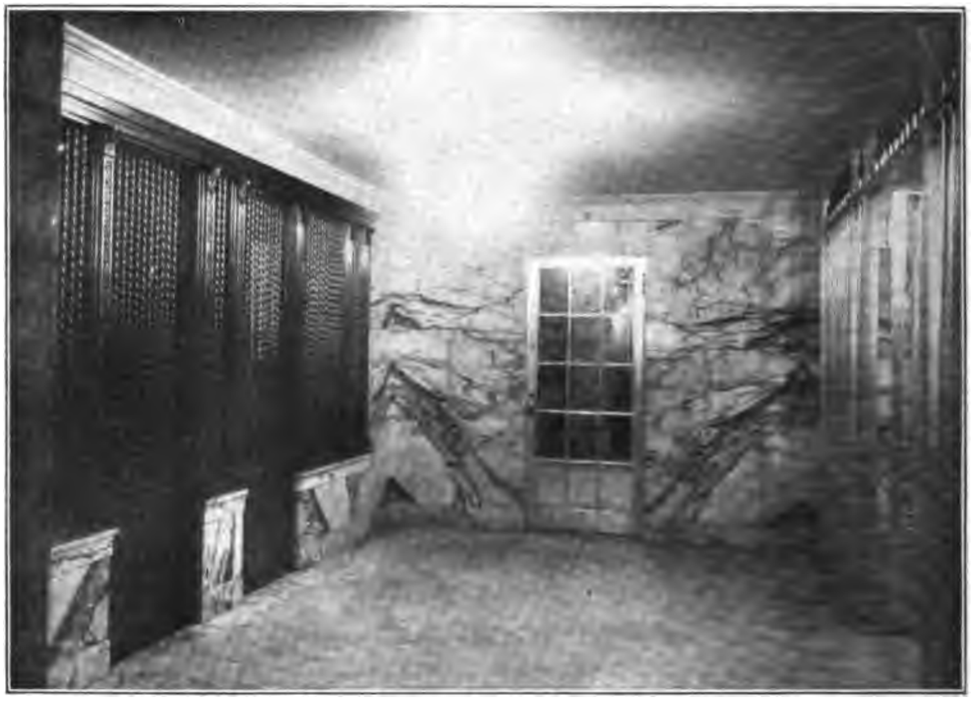
TIFFANY BUILDING—BRONZE DEPARTMENT, SECOND FLOOR.

woodwork is employed for support. This is well illustrated in the dome of the new Madison Avenue Presbyterian Church, where no iron skeleton work is employed and where the arch of the dome represents a huge span. A description of this modern fireproof church will appear more in detail in a later number of this magazine. Over nine thousand feet of this clay tiling have been installed in the Tiffany building, and the delicate coloring of the tiles lends an unusual effect to the whole ceiling.

A view of the top floor of the Tiffany building, showing the method of construction of the Guastavino arched dome, accompanies this article. A view of the first floor completed, with the diamonds and silverware exhibited, shows the flat Guastavino arch with the tiles exposed and decorated. The effect of the decorative fireproof tiles is both novel and striking and gives a finish to the interior of unusual aspect.

The other floors and ceilings not built according to the Guastavino system are of the standard flat arch end construction of hollow porous terra cotta blocks set in straight courses from beam to beam. Heavy construction skews are used in connection with the lengtheners and keys. The National Fireproofing Company furnished the fireproof blocks and tiles. The photograph of the second or bronze department shows one of these ceilings finished.

The use of Mississippi wire glass in all windows facing adjoining property and clear plate wired glass for the upper windows facing the streets, are features of the fireproofing deserving attention. All the window frames are of solid copper or other metal, with not a particle of wood in them. Yet so perfect is the work done



TIFFANY BUILDING.

Vestibule of the Safe Deposit Department, showing steel grillwork, elevator doors inlaid with brass, Pavonazzo walls and telephone booth.

that from the streets below the wired plate windows are as clear and translucent as ordinary plate glass, and the window frames appear as if finished in the finest wood. The doors at hall landings have been constructed of "Alignum," a new fireproof mineral material.

With such special fireproof features attained, it was the work of the architects to add beauty to solidity, and harmonius lines and colors to durable steel, terra cotta and bricks. The exterior effect is of a proportionate building constructed of white Italian marble. By virtue of its division into three sections the structure appears far less than 140 feet high. The general effect is that of a massive three-story building, with high ceilings and spacious rooms. The rich green copper effects of the window frames relieve the building of any monotony of color. The square pillars of white Italian marble are carried up the first story to support a railing which runs around two sides of the building. Above this white marble columns are carried to the fourth story, and similar columns run from the top of the cornice here to the overhanging roof. The exterior ornaments are simple, but not so as to attract attention to their plainness. The whole view of the building at a distance or near by is wholly satisfying and pleasing to the eye. For those who have held that it is impossible to construct a tall city fireproof building that would satisfy every artistic exaction this exterior view is commended, and it is more than likely to convince them of their error than dozens of printed pages of advice and description.

The interior view of the spacious building likewise appeals to the eye of the artist and architect. Every art of the fireproofer has been exhausted here, but it is skilfully hid from view. The interior color scheme is of a steel or silver gray. Walls, counters, ceilings and showcases contribute to this effect. The ceilings are supported by steel columns fireproofed with porous terra

TIFFANY BUILDING.

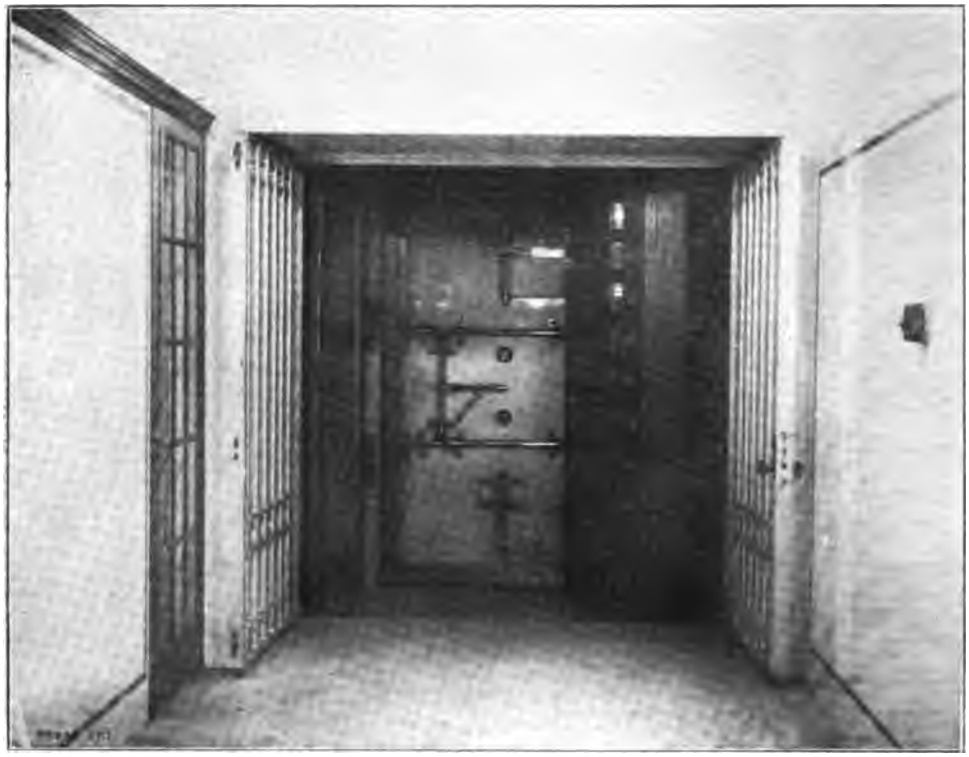
One of the entrances to the Silver Storage Vaults, showing tiers of patrons' trunks, containing silverware and other valuables.

cotta and surrounded by purplish-gray Formosa marble hollowed out to fit around the fireproofing. The silver chandeliers carry out the same color tone.

Some special innovations from an architectural point of view have been attempted. One of these is an imitation of white Italian marble in the form of Carrara glass made by the Pittsburg Plate Glass Company. This has been used for wainscoting some of the rooms, and also for the lavatories and some of the counters. The floors have also been made in various novel ways. The main store floor is of veneered teakwood laid on a base of ash, and one of the upper floors is made of the "mastic" asphalt type, composed of strips of thin oak glued together by a very adhesive asphaltic liquid. Greater durability and more evenness of finish were the chief considerations that induced the architects to adopt this floor innovation in preference to ordinary wooden strips.

The basic principle of the new Tiffany is solidity and permanence combined with the highest in art and architecture. It emphasizes more than any other building of recent construction the two great aims of all architecture. The best material and the best workmanship have been demanded and obtained, and as a type of structure that must often be duplicated in the future in our cities it stands pre-eminently as an excellent study. The adoption of such principles of building in cities is bound to have a far-reaching effect. It demonstrates that from any point of view—financial, commercial or artistic—it pays to build the best.

With special reference to the fire hazard the electrical machinery for lighting, power and heat is installed in the basement, with



TIFFANY BUILDING.

Entrance to Jewel Vault, 40 feet below the street, protected by a series of five doors. The heavy inner door is here shown partly closed. The large grated steel doors are here shown thrown open.

fireproof floors and partitions inclosing the dynamos and generators. No sparking or burning out of armatures could cause a fire that would extend beyond the machinery room. Electric current is demanded not only for lighting the building, but for driving large fans, ice plant, automatic interior parcel delivery, and for charging the electric automobiles of the delivery department. The machinery is placed upon special, isolated foundations, with a one-foot sand cushion on sides and bottom to prevent any vibration of the building when the machinery is in motion.

The style of architecture is Venetian, and it is an ornament to New York's most aristocratic avenue. It will be the repository of the famous collection of Tiffany gems, valued at three to four million dollars. The safe deposit vaults are in the sub-basement, protected by two tremendous steel doors, the outer one of which weighs three and a half tons, and the whole compartment is inclosed in brick and fireproof clay partitions. The vestibule of the safe deposit department, illustrated in a photograph, is not only a fireproof inclosure, but unusually artistic and attractive. It is finished in steel grillwork, pavonazzao marble walls and concrete floors. The elevator doors are inlaid with brass to add to the effect.

One proceeds from the vestibule to the jewel vault, 40 feet below the street level, through a series of five doors, all of which must be opened before the treasure vault can be approached. The illustration shows the heavy inner steel door with its three time locks and twenty-four massive bolts swung back, and also the double door with its burglar alarm attachment. In the foreground of the picture thrown open are the large grated steel doors which must first be opened. Besides such ample protection from burglars every precaution has been taken against loss from fire, and an interior fire would have to eat through solid concrete walls and partitions of porous terra cotta blocks to reach the steel doors and steel-encased jewel vaults.

The second floor of the building has the rooms for the president, board of directors and heads of departments. The third floor contains the famous pottery and glass collection, and on the fourth floor are the library, heraldic, designing and photographing departments. The fifth floor is the workshop, and the sixth floor contains the clock, case goods and leather workshops and storerooms. The seventh or top floor is the exhibition hall, where the public is invited on special days.

(The National Fireproofing Company and Guastavino Company furnished the fireproofing material, and Mr. Charles T. Wills was the builder. Atlas Portland cement was used in the building and the metal lockers were made by the General Fireproofing Company.)

A FIREPROOF GARAGE

ONE of the demands to-day appears to be absolutely fireproof garages where automobiles can be stowed with the maximum of safety from fires. A number of these have recently been erected in New York City. The inflammable nature of the gasoline and naphtha used for the machines, and the necessity of storing considerable quantities for daily use, have so increased insurance rates on such buildings that unusual efforts have been made to make them fireproof. Adjoining property suffers when a garage is erected, and property owners protest against their construction. The result of these influences has been that the modern, up-to-date garage is as nearly fireproof as human ingenuity can make it. The accompanying illustration of Tiffany's garage at 140 East Forty-first street, New York City, is a fine example of an artistic and perfectly fireproof garage. There is not a particle of wood in it. The first floor and foundation are of concrete, and the walls are of steel surrounded by hollow porous terra cotta. The two upper floors are also of steel skeleton work and fireproof terra cotta. The elevator is in a separate fireproof inclosure, and all floors and rooms are separated by fireproof partitions. Nothing less than an explosion which would destroy the walls would permit the spreading of flames.

TIFFANY & CO.'S FIREPROOF GARAGE, NEW YORK CITY.

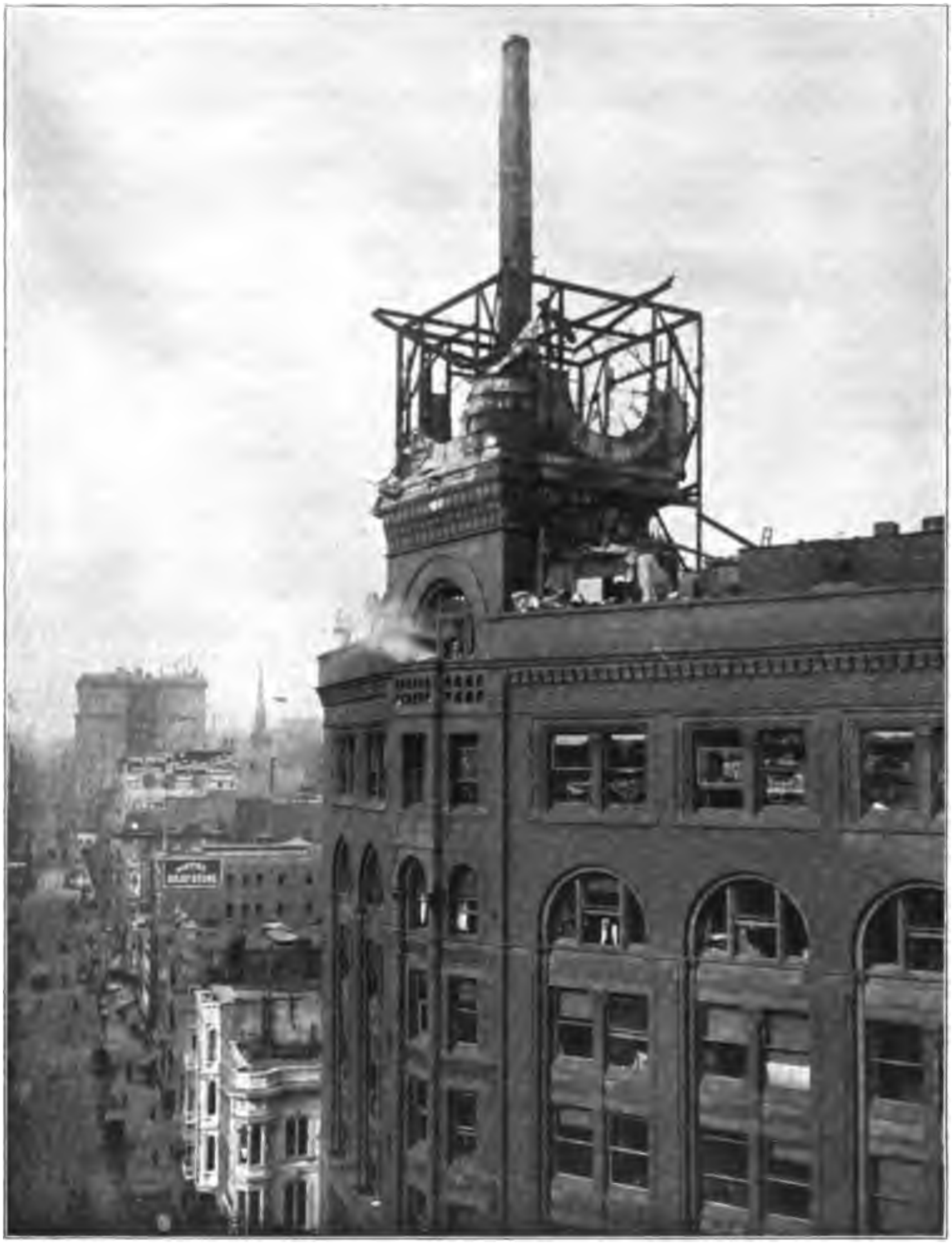
THE SAN FRANCISCO CHRONICLE BUILDING SAVED BY STEEL AND HOLLOW TILE FIREPROOFING

THE illustration here given of the appearance of the San Francisco Chronicle building on the morning after the fire, which occurred on the night of November 9, is another speaking evidence of the value of steel and hollow tile fireproofing. The only part of the building destroyed by fire was the clock tower, which extended several stories above the roof. All the remainder of the damage was by water. At the time of the fire election returns were coming in and the result of the election in San Francisco was known. There was much celebration with fireworks going on, and it is supposed that some of them caught in the tower. That was the only part of the building which was not fireproof, and therein lies the lesson which we have constantly and persistently been trying to drive home to all—not to leave any exposed part of a fireproof building without protection equal to that elsewhere employed.

The Chronicle building was erected in 1889 from plans made by Burnham & Root of Chicago and was the first steel cage building erected in San Francisco. It was ten stories high and all the fireproofing was with fire clay hollow tile made by Gladding, McBean & Co. of Lincoln, Cal., from dies furnished by the Pioneer Fireproof Construction Company of Chicago. It was built in all respects like many other buildings in the latter city, except as to the tower. As the high skeleton building was a new venture for San Francisco, there was some doubt as to the propriety of building the tower with brick and hollow tile on account of a possible danger from seismic disturbances. Accordingly the first stage of the tower, containing the very large clock, was built with a steel frame and the remainder with a wooden frame, and the whole was covered with copper on the exterior. The floors also were wood, and as the tower contained the art department there was a large amount of combustible material to make a very hot fire. The result was that the tower was practically destroyed, but the fire extended no further, notwithstanding the fact that very little water could be carried to that height. The single chimney shown in the illustration is one of four that were built of hollow tile in the angles of the tower, and shows what was its original height. The occupants of the upper story were driven out by smoke and heat, but the contents were only damaged by water. The elevators made many trips during the fire, but were stopped when all the inmates had been taken down and water had reached the shafts. This water, thus finding an outlet, did much damage in the first story and basement, but it was not so great as to prevent the issue of the newspaper from its own plant two days after the fire.

It is not difficult to conjecture what the result would have been had this building been of ordinary or mill construction, considering the difficulty of raising water to such a height.

San Francisco now has many other buildings fireproofed with hollow tile by the same firm that manufactured and set the work in the Chronicle building. Most of them are still higher. The confidence instilled in the people of San Francisco by the success of these structures in resisting the slight disturbances by earthquake which occasionally affect that city has satisfied Mr. M. H. De Young, owner of the Chronicle, that it is feasible to increase the height of the building. Work had been actually commenced on an ex-



CHRONICLE BUILDING AFTER THE FIRE.

tension on the Kearney street side before the fire, and the contract will include the addition of two stories to the original building and the erection of a still higher tower. It is hardly necessary to add that the system of construction and fireproofing used in the old building will be duplicated in the extensions, and the new tower will be fireproof. The work is being done from plans made by D. H. Burnham & Co. of Chicago, and Gladding, McBean & Co. are doing the fireproof work.

THE MACHESNEY BUILDING OF PITTSBURG

BY W. I. PARRY.

FOURTH avenue between Market street and Smithfield street is to Pittsburg what Wall street is to New York. This narrow thoroughfare and its immediate vicinity are so crowded with banks, trust companies, brokers' offices and kindred interests as to suggest that the air in that particular locality is essential for the business existence of the financial craft.

This condition will, perhaps, explain why a building so tall as the Machesney is being erected in such cramped quarters, for the edifice, as will be seen from the picture of the architect's drawing (Fig. 1), is nineteen stories high, with an additional mezzanine floor, while reference to the plan of the typical floor will show that the lot measures only 60 feet 2¼ inches by 80 feet. How to handle this small lot to advantage and provide a steel frame that would meet all the requirements of the loads and stresses while utilizing the area to the best earning capacity was the problem encountered by the architect, Mr. T. H. Scott, and the consulting engineers, Messrs. Kindl & Glafey. That the question has been successfully solved is indicated by the architects's floor plan (Fig. 2) and the scheme of steel framing shown in the half-tone pictures.

In the first place the building is surrounded on three sides by old structures whose owners would not accept any proposition looking to the construction of party walls. This, of course, resulted in the necessity of using a cantilever system throughout. In addition to this the small area of the building required the cellar level to be carried down about 35 feet below the street to give adequate room for the machinery. As this brought the cellar level about 20 feet below the three adjacent walls of fairly high buildings, it was necessary to shore up these walls and to build new ones below them down to the new level. A partial idea of this work

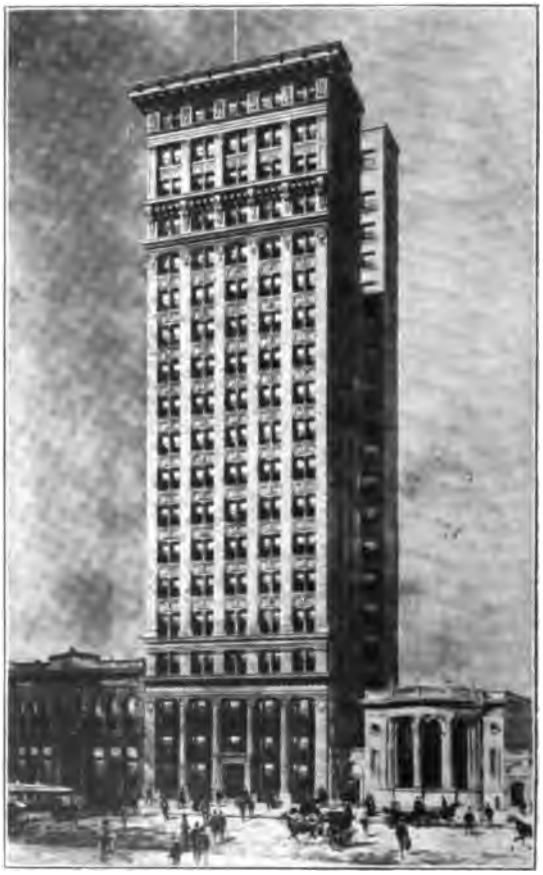


FIG. 1—THE MACHESNEY BUILDING, PITTSBURG, AS IT WILL APPEAR WHEN COMPLETED.

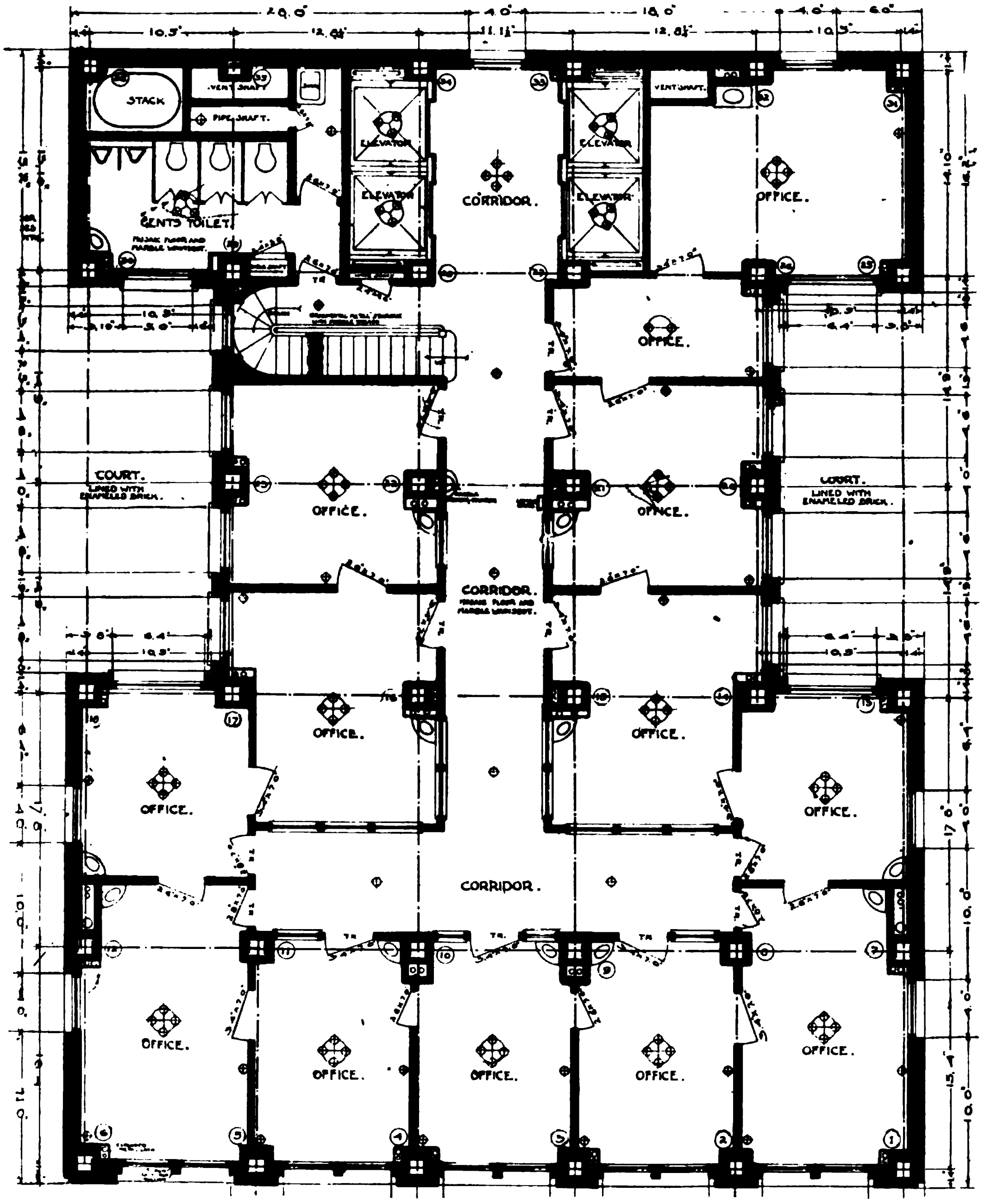


FIG. 2—THE MACHESNEY BUILDING, PITTSBURG—PLAN OF TYPICAL OFFICE FLOOR.
T. H. Scott, Architect; Kindl & Glafey, Consulting Engineers.

may be had from Fig. 3, showing three of the holes in the walls where the shoring had been removed after the construction of the new walls below.

The question of wind effect received much careful consideration and the scheme adopted was the simple principle of binding the building externally at each floor level with deep girders extending in all cases outside the columns and completely around the frame. This arrangement is well illustrated by Fig. 4, which also gives

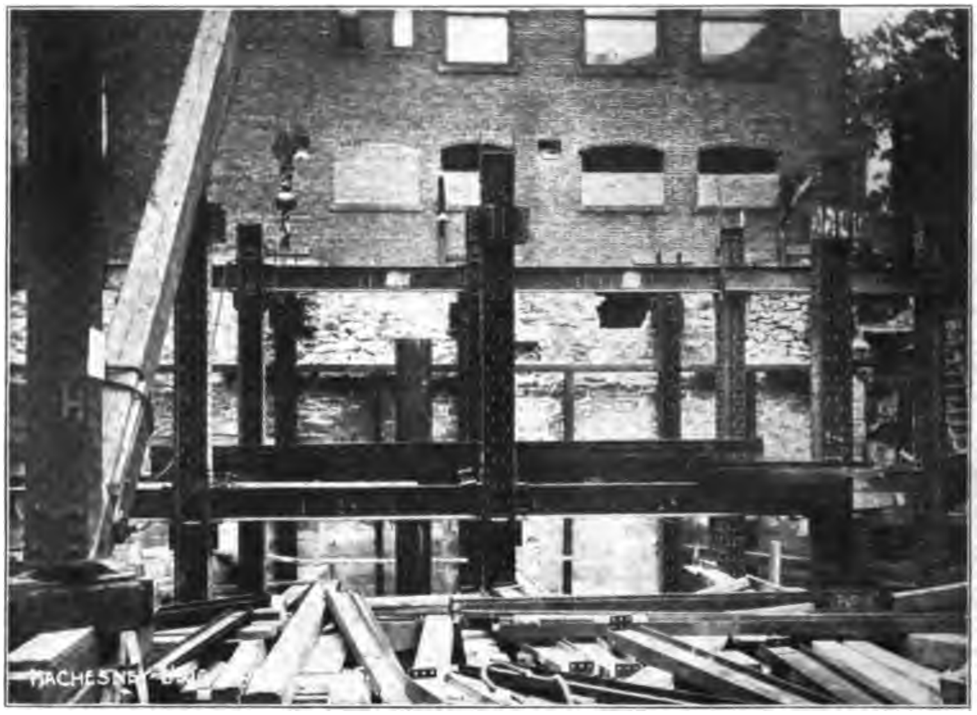


FIG. 3—MACHESNEY BUILDING, PITTSBURG.

an idea of the double interior girders of the lower stories straddling the columns and acting as struts for wind effects in addition to receiving the load of the floor beams. These interior girders, being designed as a part of the wind bracing, have their connections to the columns made with the angles of their webs figured for load carrying with additional seat and hitch angles riveted to their top and bottom flangles figured for wind. This system of wind bracing dispenses with the diagonal or portal bracing so often used, which is usually such a nuisance and furnishes so much ground for argument to the engineers.

Illustration (Fig. 5) shows the steel framework in course of erection, the picture being taken from Fourth avenue, and gives a fair idea of its construction. The building on the right is the Pittsburg Stock Exchange and that on the left is the Merchants' & Manufacturers' National Bank.

The plate and angle type of columns is used throughout the structure. The connections of beams and girders are original in many points, having a full opening or pocket between the column and the beam or girder. This allows the free passage of pipes and wires, which of necessity in this building must be carried from story to story in this way.

The floor arches are practically of uniform depth, those in the upper stories being 11 inches, while those in the lower floors are 15 inches.

As will be seen from the typical floor plans, the arrangement of rooms and light wells is such that, even in the remote contingency of the light from the side walls being interfered with by future building operations, each room will still be supplied with ample light from the wells.

The lower floors are well designed for banking purposes, while the upper stories are planned for offices. The location of the building ensures its popularity and it

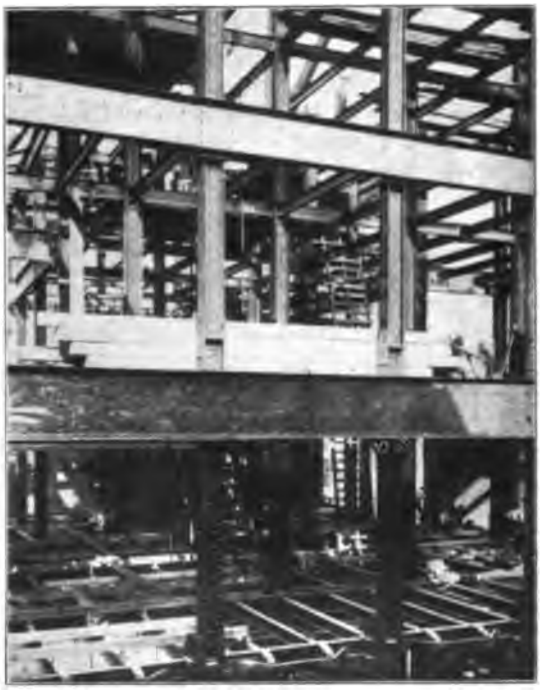


FIG. 4—MACHESNEY BUILDING, PITTSBURG.

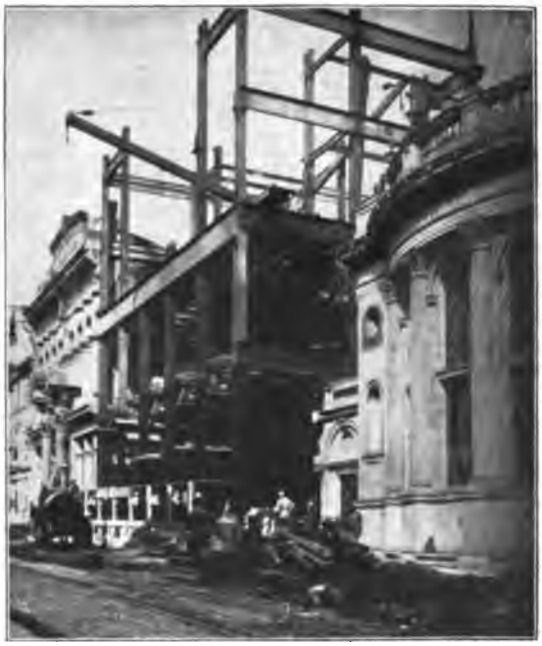


FIG. 5—MACHESNEY BUILDING, PITTSBURG.

will in all probability be a profitable investment.

The total tonnage of structural steel involved is about 1,400 tons. This was rolled and fabricated by the Carnegie Steel Company of Pittsburg.

PLEA FOR THE ENACTMENT OF STATE BUILDING LAWS

BY F. W. FITZPATRICK.

REALIZING the difficulties in the way of getting our cities to adopt something like uniform building laws, and, indeed, to get some of them to adopt anything like a decent building law at all, the International Society of Building Inspectors is turning its every energy toward securing state legislation—a movement that deserves well of every thinking man. If the state will but pass basic, fundamental building regulations, fixing the minimum precautions against fire and possible destruction, below which no one will be permitted to go, such regulations will form a splendid neucleus about which sane cities can weave additional, more complete building regulations. Cities and towns not sane enough to do anything for themselves will at least have a ban placed upon poor construction within their limits. I submit that it is one of the wisest pieces of legislation that is proposed along that line. Steps are being taken by the society to have a uniform bill, with the caption of "State Fire Protection," presented in every legislature at its next session. The bill, as drafted, is but brief, and while it may not be perfect and all-covering, it is certainly a step in advance and one that should have been taken years ago. One of the great troubles from which this country has suffered is that the smaller places build but for to-day, with never a thought of what their recklessness and shortsightedness may entail. The quotation I have so often used, though I have never been able to find its author, is certainly worthy of being kept conspicuously before us when we plan anything having to do with a municipality, however insignificant the latter may then be. It is a bit sententious, but the fellow who wrote it knew a thing or two: "The metropolis of to-day is but the village of yesterday and suffers for the sins of its molehill progenitor."

The bill follows, and I earnestly request my readers (whether they be the skeptics before alluded to, or belong to the far greater number, thank heaven, who feel and express themselves so kindly toward me) to send in criticisms and suggestions for its betterment. We wish to present a document to the States that will not need tinkering nor amending, something that will be so clear, brief, so evidently a long-felt want, that it will go through with a whoop and hurrah—unanimously:

A BILL TO REGULATE THE CONSTRUCTION OF BUILDINGS IN CITIES, TOWNS AND OTHER SETTLEMENTS IN THE STATE OF ———.

Whereas, The loss of life and of property, both public and private, through fires having reached appalling proportions, and there being danger that such losses will continue increasing as years go on, by reason of the careless if not criminal mode of construction of buildings that now generally obtains and very largely because the people still labor under the mistaken impression that wood and other inflammable materials constitute economical means of construction and that in most cities and towns there are not sufficiently stringent municipal regulations on that head, or else through negligence or other causes such regulations as do exist are not rigorously enforced, it has become expedient and necessary that the state interfere, for the protection of the lives and property of its people. Therefore:

Be it enacted by the Senate and House of Representative of the state of ...., that upon the date of approval of this bill the following regulations anent building will become operative throughout the state, and that all parties thereafter constructing buildings in contravention of the spirit and wording of this act shall be guilty of a misdemeanor and held punishable for such offences as herein provided.

1. In no city or town, village, settlement or aggregation of buildings adjacent but owned by different individuals, shall there be built a frame building of any description more than three stories high, or forty feet above the ground.

2. If such frame structures be built up solidly or continuously upon a block, or along any street or highway, there shall be dividing walls, without any openings in the same, and carried up to at least two feet above the roof line, at least every sixty feet in width and to the full depth of the buildings. Such walls to be at least two bricks thick or their equivalent in fireproof tile, stone, concrete or other incombustible material. And in such continuous buildings, where there are more than four such divided spaces, then the roofs shall be of metal or slate or other spark-proof material.

3. Detached houses and other buildings not higher than three stories, and built entirely of wood, or with wooden outer walls and roofs, must be at least ten feet apart. If built of brick walls and uninflammable roofs, residences and other buildings may be five feet apart, but the windows in all such walls must not be opposite each other; and if windows be further provided with automatically closing fire-shutters or wired glass sash such adjacent walls may be even closer together. The same regulation as to width between buildings is to govern widths of light-courts or other openings in the buildings themselves when the solid parts of such buildings are thirty feet wide and over.

4. If a three-story wooden building is to be used as a tenement, school or hotel or where more than forty people are housed on a ground space equivalent to fifteen hundred square feet or less, there shall be two stairways in separate parts of the building and giving directly upon exits from the building and such stairs shall be accessible from each story and from all parts of the building.

5. In all wooden churches, halls and other places of occasional public assemblage, the auditorium floor proper shall not be over one-story, or eighteen feet above the ground, and there shall

be a clear and direct stairway of at least six feet width, giving directly upon the main exit to the street from such auditorium floor. If there is a gallery in such hall or church then there must be a separate stairway of at least four feet width, giving directly upon the street, and in no case shall such hall or church, built of wood, wood walls, floors and roofs, accommodate more than two hundred people in the gallery and seven hundred on the auditorium floor, nor shall there be more than one gallery in such building.

6. Churches and halls of greater capacity must be constructed as to walls, floors and roof, of uninflammable material, and all stairs must be of iron or other uninflammable material, and the main or auditorium floor must not be over six feet from the ground. In all such halls or churches there shall be separate and direct exits of at least four feet width, one for every three hundred people on the auditorium floor and independent fireproof stairways for each gallery and the equivalent of five feet in width per three hundred people accommodated, such gallery stairs giving directly to the street and inclosed in fireproof walls with doors only from the gallery served. Besides this, there shall be an outer fire exit with an iron stair at least three feet wide, provided with metal handrails and so arranged as not to cross or be exposed to flame from any window or door in the wall, one such stairway to every gallery over twenty feet from the ground.

7. Hotels, shops or other buildings housing many people may be five stories high or seventy feet if constructed of brick or other uninflammable walls and spark-proof roofs and wooden floor joists and partitions, but with the air spaces between all joists and studding cut off by bricks, tiles, metal or boards the full size of the square of the air spaces, and that all the plastering be done upon wire lath or expanded metal and that there be tanks and water supply, adequate hose and other necessary precautions taken to minimize the danger of spread of fire. But in all such buildings of five stories in height there shall be a stairway from the street level to the top story inclosed in a fireproof wall, the stairs of uninflammable material and absolutely cut off from the basement by fireproof flooring and giving directly to an exit on the street and accessible from every story by an automatically closing fireproof door opening outward, at the landings of the said stairs. And in all such buildings there must be brick or other fireproof walls cutting up the floor area in sections of not over 10,000 square feet, and if openings are desired in such walls they shall be protected with automatically closing fireproof doors. All such buildings shall also have, far removed from the aforementioned stairway, a fire-escape of metal and of approved construction, from the roof to the ground and accessible from open hallways at every story.

8. Warehouses or other such buildings, or workshops may be six stories high or eighty feet provided they be enclosed in fireproof walls and roof and their interior structure be of what is known as "mill construction" and if served by enclosed fireproof stairs as described in section 7, and the floor area similarly cut up into sections of not to exceed 10,000 square feet by fire walls and automatically-closing fire-doors.

9. In all such buildings as described in section 7 and 8 there shall be stairs of the character specified and at least 5 feet wide in the clear, from story to story, proportioned per 300 employes or people usually or at any time present in such building. And there shall be no open elevator or other wells or skylight shaft or shafting spaces open vertically through the floors. All such necessary openings in the floors must be enclosed in continuous fireproof walls with automatically-closing doors thereto or wired glass in metal sash.

10. Buildings of semi-fireproof. construction, that is fireproof outer walls and roof, floor construction of wide span concrete or tile and uninflammable partitions, but with wood or other combustible floor covering, doors, windows and "finish" generally, though without any open spaces back of such woodwork, and all such woodwork coated with some form of approved fire-retarding paint, may be eight stories or a hundred feet high, provided the regulations prescribed about stairs and elevators and fire-escapes in former sections be likewise applied to this section, though there may be light-wells and other openings vertically in the floors in buildings serving purposes of stores or workshops. In all such structures ample provision of hose and fire apparatus, power for pumps, etc., must be made and constantly kept ready for service.

11. Buildings of absolutely fireproof construction, that is of walls and roof and all exposed structural parts of fire and water proof material, and all structural steel members properly encased in cement and protected with at least 2 inches of brick, fireproof tile, concrete (other than cinder concrete) or other fireproof materials, and the floor construction of flat arches not over 8 feet spans or segmental arches of not over 16 feet spans and of brick or fireproof clay tile or of reinforced concrete of not less than 6 inches thick and of no weaker amalgamation than one part cement to 2 parts sand to 3 parts crushed stone or

brick or tile or slag (no cinders) and all the floor coverings, the interior "finish" and the doors and sash and other trimming of the building of uninflammable material, and the exposed windows, on alleys or courts covered with fire shutters or glazed with wire glass in metal sash and the stairs and elevators protected by inclosures and doors as provided in other sections, may be of any height desired or as regulated by the municipality; provided that in all such buildings over 100 feet high there shall be maintained tanks on the roof with water in sufficient quantity with necessary hose, pumps in *constant readiness* and other such individual protection as the fire warden shall deem necessary for that building.

12. Further, the state fire warden may issue special permits or dispensations from these requirements to builders of grain elevators or other such special buildings, to erect them of greater height than the classes above described for buildings built in the different modes of construction provided he deem them of not extra danger to the surroundings or creating any extra hazard there where they are proposed, and such buildings must be at least 500 feet removed from any other structure and in no way directly endangering any other party's property. And such special buildings must not be used for manufacturing or other purposes than storage only and where not over 10 employes are at any time at work upon any one of the upper stories.

13. The fire warden of the state shall be the officer empowered to enforce these regulations. And the governor shall appoint such assistants as the said fire warden may require, who shall be state inspectors of buildings (and whose salaries and the maintenance of suitable offices, providing of stationery, furniture, traveling and other necessary expenses shall be paid from the general fund) and the duties of said inspectors shall be to see that these regulations are enforced throughout the state and to them are hereby given full police powers to enforce the said regulations and to bring offenders thereagainst before the courts of proper jurisdiction.

14. The owner or owners of any building, structure, wall, flooring or any part thereof, where anything in violation of these regulations shall be placed or shall exist and any architect, builder, plumber, carpenter, mason or other craftsman or laborer who may be employed or assist in the commission of any such violation, and all persons who shall violate any of the provisions of these regulations, or fail to comply therewith, or any requirement thereof, or shall build in violation of any certificate or permit issued thereunder, shall for every and each violation or noncompliance be guilty of a misdemeanor and upon conviction thereof shall be fined not less than $5, nor shall the punishment for the first offense be more than a fine of $500 or imprisonment for 6 months, but any subsequent offense or violation of these regulations shall make one amenable to punishment at the discretion of the court.

OUR SINFUL EXTRAVAGANCE

EXTRACTS FROM PAPERS READ AT THE CONVENTION OF THE AMERICAN SOCIETY OF MUNICIPAL IMPROVEMENT, HELD AT MONTREAL, CANADA, SEPTEMBER 5, 1905.

At the convention of the American Society of Municipal Improvements, held at Montreal, Canada, September 5, 1905, two important papers were read bearing upon the extravagance of the United States and Canada in allowing such a vast amount of property to go up in flames annually, without the adoption of adequate means for its prevention. Both authors advised an increase in the number of fireproof buildings of all classes as the main remedy. The interest in this subject is now beginning to extend through all the provinces of Canada and the recent conflagration at Toronto has been a valuable incitement to the people of the Dominion to profit by its lessons. We give some extracts from the paper read by Mr. Alcide Chaussee, architect and building inspector of Montreal, who is also vice-president of the International Society of Building Inspectors. The subject of his paper is, "Our Sinful Extravagance and the Need of Stricter Building Regulations." After giving numerous statistics on the loss of property and lives in fires and commenting upon them, Mr. Chaussee continued:

MR. CHAUSSEE'S REMARKS.

"And what is being done to prevent this terrible loss? A little, almost hopelessly little in the way of prevention, though much as a palliative. We throw water upon our fires (and are constantly endeavoring to throw it more scientifically) and expect the next fire to burn less fiercely because thereof. In San Francisco, for instance, there is little being done, comparatively, to improve the standard of construction. It is notoriously a wooden city, yet insurance rates are fairly low because, forsooth, the fire department is so excellent. That is like extolling the advantages of a certain locality as a health resort. It may be miasmatic, yellow fever may stalk abroad, its houses and streets may be foul, but its doctors are so skilful. As far as cure goes, note how little we have done. In all this broad land there are but three thousand buildings that can be called "fireproof," and that very largely only in their structural parts, that is, fireproof buildings like those in Baltimore, whose steel frames and terra cotta floors withstood the attack where all else about them, the stone, the marble, the wood, went the way of all things combustible or destructible.

"What is the cure? But two things will tend toward the accomplishment of that end, and neither water-supply nor fire department is one of them. The first thing to do is so to surround our old and dangerous buildings with safeguards, to direct their demolition as soon as possible. The second is to absolutely bar the erection of combustible structures in the future. Some would say that that would be a hardship upon the individual, for we have grown so accustomed to using wood that it seems to be the fixed mode of construction, sanctioned by time and custom, a sacred inheritance any tampering with which must needs savor of sacrilege. Therein the folly.

"There was a time when wood construction was true economy, indeed the only thing available. To-day, wood is almost a luxury. Lumber has gone up so much in price, over 150 per cent in the last few years, while the fireproof materials, brick, steel, fireproofing-tile, cement, et cetera, have been cheapened in cost of manufacture. There is absolutely no economy in building even the simplest cottage of wood. Granted that the first cost in the fireproof material is ten per cent more than wood. But, consider the wear and tear, the maintenance, the insurance, and all those incidentals, and your frame cottage will have cost you in twenty years' time 30 per cent more than a well-built, non-inflammable structure would have done.

"The deterioration in the value of a well-built, fireproof building, fire-resisting in its finish and decoration, is but one-ninth of 1 per cent a year, while that of the ordinary wood joists and stud partition affair is nearly 4 per cent a year. Besides, such improved construction has a host of other advantages, being sound-proof, vermin-proof, warmer in winter and cooler in summer, and in every respect vastly superior to the old way of building.

"Some weak-hearted ones would have us believe that to bring about those conditions would involve superhuman effort, well-nigh an impossibility. But our cities have accomplished other reforms quite as revolutionary, so thought at the time, as this would seem to be. The people sometimes chafe at what they term the restraint of individual liberty, involved in the enforcement of drastic curative laws. But not for long. North American intelligence is such as to soon recognize the value of perhaps individual sacrifice involved in a great public benefit. We may not hope, however, to bring the desired conditions about by mild persuasion or preaching. It will take vigorous action, and the only action that will accomplish anything is the adoption of most stringent building regulations, and their strict enforcement by competent, executive officers.

"Building in general terms requires the clearest definition and restriction, while every class of building calls for thoughtful and comprehensive special legislation. It we think that theatre-builders ought to enjoy certain latitude, we have but to scan the record of the Iroquois theatre; if it be suggested that dock-sheds are hardly worthy of special legislation, think of what happened at New Orleans; if wholesale warehouses be deemed unimportant, note what happened in Toronto. And so it is with every class of buildin. Nothing can be deemed unimportant, for that very building, or class of buildings, may prove the ruin of half your city. Strict building regulations, I say, are all-important and supremely necessary. Two hundred and sixty-four of our American and Canadian cities have realized that, for there either have been, or are being, adopted perfected building regulations in that many cities. One hundred and sixteen cities or considerable towns heretofore unprovided with a special building officer or department have the creation of such office under consideration. There are happy indices of betterment wherever we may look, thank Heaven! but it is just such societies as this made up of thinking, public-spirited men, zealous in the upbuilding of their several municipalities, that can do a world of good in facilitating this work and bringing its consummation about even in our own time.

"Of all the cities that have given most thought and earnest work to this matter, Cleveland easily takes the lead. Her building ordinances may be said to be the combined work of nearly all the building experts in the country. A vast sum was spent upon its preparation. Every item was discussed by experts and its effects upon the legal side of the question as well as the technical were carefully weighed by specialists, and the society of which I am an officer, the International Society of Building Commissioners and Inspectors, has virtually advocated that ordinance *in toto* as its model and standard, and is urging every city in both countries to also adopt it with as little change as possible. Some may think it verbose. It is *complete*, and leaves nothing to the misinterpretation or misjudgment of a perhaps too-lax officer. Every point is covered.

"I submit, and you will readily appreciate it, that it would be a tremendous advantage to have a uniform code throughout both countries. As it is now, one city will permit of a certain thickness of brick-walls to carry a certain height of stories; a city fifteen miles distant therefrom insists upon an entirely different standard. So it is with the allowable strains in framing, et cetera. The building business of all the cities is so closely related that this everlasting difference is not only confusing but leads to endless discussion and trouble. A hundred other considerations should compel us to advocate not only good building regulations, but uniform ones and I sincerely trust that each one of you gentlemen will not only advocate in his own city the necessity of wise and strict requirements, but that he will go a step farther and strongly urge the council, or whatever power is in charge of that branch of municipal service, to adopt the code that is most worthy of being made standard, and that has already been engrossed upon the laws of so many of the cities of these United States and Canada."

A paper was also read which has been prepared by our well-known contributor, F. W. Fitzpatrick, who was unable to be present. Its subject was "Good Building." The following are the closing paragraphs:

EXTRACTS FROM MR. FITZPATRICK'S PAPER.

"While I have the greatest sympathy with, and, indeed, work most zealously for the artistic development of our cities, I think we have perhaps overworked that field at the expense of sound construction. Come with me through the residence streets of almost any city and we will see handsome residences and dainty cottages, very models of artistic daintiness; and so even with the great office buildings and municipal structures. They are pleasing to the eye, their proportions are artistic, the materials of the exteriors are expensive, and even the decorations of the interiors show refinement and a considerable development of apparently real art. But in nine cases out of ten these handsome fronts and decorative interior are but a gloss, a veneer to very indifferent, if not inferior, construction, a simulation of stability and permanence, and real improvement. Take any municipal or private building, your own homes, for instance. Supposing your architect has planned a marble exterior, fireproof construction, the best of eqiupment and rather elaborate interior decoration. The bids come in and are away above the appropriation you have set aside for the building. Nine chances to one the first thing both you and the architect would think about cutting off would be the fireproof, permanent mode of construction, the next thing would be the saving in some of the vitals, possibly the plumbing or something of that kind, and the last thing to be pared down will be the marble front. I tell you its our national failing to love a good front and be not too inquiring as to what it covers up. In a building it savors much of the ridiculous, reminding one of an unlettered, unwashed savage gotten up in the habilments, the toggery, of a gentleman, in the hopes of deceiving us. And that very failing, the blindness to the real purpose of building, is what is costing us thousands of lives and millions of dollars every year.

"Think, too, of all the municipal improvement, so-called, that is made necessary by this folly of flimsy construction; improved water supplies, magnificent fire departments and what not, to protect us at least a little from the danger we have created and are adding to every day.

"The question naturally arises at this point, "What is a good building, sound construction?" Let us spend a few minutes on the subject, it is well worth our time and attention. To begin with, the requirements naturally vary according to location. But let us set down as fundamental rules a few salient points. We know that wood burns; we know that granite, all stones, marble, slate, metals, concrete, glass and all plasters into which lime and sand enter as parts of the composition, are very much damaged, if not destroyed by fire. Now then, since fire seems to be the most destructible element to which municipalities are exposed, it would seem meet and reasonable to do everything possible to escape the ever-present danger and forestall the possibility of that danger continuing, ad infinitum, to threaten every community, every assemblage of buildings. The first thing to do, rationally, would seem to be to avoid the use of wood anywhere. It isn't a necessary material. There was a time when timber construction was an economy, indeed, the only thing available. Those conditions no longer exist but we have gotten into the habit, it has become hereditary, and, though wood is actually a luxury, we foolishly go on insisting upon the use of it. The next thing is, since we know that certain materials are damageable by fire, to avoid their use (or to protect them if they are used) in places where fire can affect them. The perfect building, the unassailable building, is one whose exterior is built of well burned brick, whose decorations are of similarly well burned molded brick or terra cotta, whose roof is covered with asbestos, tile or cement; whose skeleton supports are of steel, amply protected by cement from corrosion and surrounded with fireproofing tile to guarantee their safety against fire; whose floors and partitions are built of fireproofing tile or brick; whose windows are of wired glass in metal or asbestos sash, protected again in its most vulnerable points with fireproof shutters; whose interior finish is of asbestos, some plastic composition, or metal, whose finished floors are of tile, marble, or cement, or rubber; whose decorations are plastic or chromatic; whose stairs and elevators are inclosed in tight fireproof partitions with automatically closing doors, making invulnerable shafts of the same and thus cutting off the flue-like induction that vertical openings offer to fire and its consequent rapid spread; whose furniture is largely of metal, glass or other non-inflammable material; whose carpets and hangings are reduced to the minimum and in whose entire devising the strictest attention is paid to its permanency, stability, and fireproof qualities. That is a picture of a really fireproof building, an ideal construction, one that is attainable but, I grant you, a trifle more expensive than the ordinary construction of to-day. But really, it is the only form of building that should properly be called fireproof at all.

"There is a very grave misconception in the public mind as to what is a fireproof building. All sorts of things masquerading under that name have been foisted upon the people, and naturally, those who have been once beguiled but have lost their property through fire, have become skeptical and to them nothing is fireproof, while to the man not yet initiated everything that is so labeled is blindly accepted as such. Well, taking this ideal structure as a standard, the thing to do is to approach as nearly as possible to it in every building, modifying its high requirements, however, according to local conditions. For instance, if you are to erect a building in the center of a large lot, permanently away from everything else, then is the danger of external attack remote indeed and you are perfectly justified in using granite or marble, or the other damageable materials (but not the inflammable ones) upon its exterior. Or, if the building-to-be is surrounded by nothing but fireproof buildings, then too, is external exposure minimized and latitude is justifiable. But if your building is in a dangerous neighborhood, surrounded by old ramshackle buildings, wholesale warehouses of flimsy construction and filled with inflammable materials, then are you justified in nothing less than the use of the best, fire-resisting materials. If your building is to be occupied by few people, highly intelligent and interested in the structure's welfare, and if there is to be no fire or cooking, or dangerous illuminating, then you may indulge in considerable latitude in the interior and fittings, but those conditions are remote. Your greatest danger is generally from within and therefore should everything be done to minimize that danger to the utmost. Just so much as your exposure increases should your precautions be greater, and, inversely, may you depart from the most stringent requirements as those conditions become more favorable.

"The fashion is to criticise conditions, to carp at what is being done, to call attention to our wrongs and to heap vituperation upon our wrongdoers. That is all well enough, but let us, a body of intelligent men, not be satisfied with this mere preliminary, this 'campaign of destruction,' this going after the enemy, but let us, shoulder to shoulder, work for the elimination of what is wrong and the upbuilding of a system, the creating of conditions, a 'campaign of construction,' a cure for the wrongs that we deplore, and let us map out now a program, a scheme of work, to bring about the happy consummation of these much-to-be-desired reforms."

UNIFORM BUILDING LAWS

RECOMMENDATIONS OF THE NATIONAL BOARD OF FIRE UNDERWRITERS FOR THE CONSTRUCTION OF FIREPROOF BUILDINGS

(Concluded from November.)

Reinforced Concrete or Concrete Steel Constructed Buildings.

THE term "reinforced concrete" or "concrete-steel" in this section shall be understood to mean an approved concrete mixture reinforced by steel of any shape so combined that the steel will take up the tensional stresses and assist in the resistance to shear.

Reinforced concrete construction may be accepted for fireproof buildings, if designed as hereinafter prescribed; provided, that the aggregate for such concrete shall be hard burned broken bricks, or terra cotta, clean furnace clinkers, entirely free of combustible matter, clean broken stone, or furnace slag, or clean gravel, together with clean siliceous sand, if sand is required to produce a close and dense mixture; and provided, further, that the minimum thickness of concrete surrounding and reinforcing members ¼ inch or less in diameter shall be 1 inch; and for members heavier than ¼ inch the minimum thickness of protecting concrete shall be four diameters, taking that diameter, in the event of bars of other than circular cross-section, which lies in the direction in which the thickness of the concrete is measured; but no protecting concrete need be more than 4 inches thick for bars of any size; and provided, further, that all columns and girders of reinforced concrete shall have at least 1 inch of material on all exposed surfaces over and above that required for structural purposes; and all beams and floor slabs shall have at least ¾ inch of such surplus material for fire-resisting purposes; but this shall not be construed as increasing the total thickness of protecting concrete as herein specified.

All the requirements herein specified for protection of steel and for fire-resisting purposes shall apply to reinforced concrete filling between rolled steel beams, as well as to reinforced concrete beams and to entire structure in reinforced concrete. Any concrete structure or the floor filling in same reinforced or otherwise, which may be erected on a permanent centering of sheet metal, of metal lathing and curved bars or a metal centering of any other form, must be strong enough to carry its load without assistance from the centering, unless the concrete is so applied as to protect the centering as herein specified for metal reinforcement.

Exposed metal centering or exposed metal of any kind will not be considered a factor in the strength of any part of any concrete structure, and a plaster finish applied over the mental shall not be deemed sufficient protection.

MACHINE MIXING NECESSARY.

All concrete for reinforced concrete construction whenever used in such buildings must be mixed in a machine which mixes one complete batch at a time, and entirely discharges it before another is introduced. At least 25 complete revolutions must be made at such a rate as to turn the concrete over at least once in each revolution for each batch.

Before permission to erect any concrete steel structure is issued, complete drawings and specifications shall be filed with the commissioner of buildings, showing all details of the construction, the size and position of all reinforcing rods, stirrups, etc., and giving the composition of the concrete.

The execution of work shall be performed by workmen under the direct supervision of a competent foreman or superintendent.

The concrete shall be mixed in the proportions of 1 of cement, 2 of sand and 4 of other aggregates as before provided; or the propositions may be such that the resistance of the concrete to crushing shall not be less than 2,000 pounds per square inch after hardening for twenty-eight days, but for reinforced or plain concrete columns the mixture shall not be leaner than 1 part of cement, 2 of sand and 5 of the coarser aggregate in any case. The tests to determine this value must be made under the direction of the commissioner of buildings. The concrete used in concrete-steel construction must be what is usually known as a "wet mixture."

Only high grade Portland cements shall be permitted in reinforced concrete or concrete-steel constructed buildings. Such cements, when tested heat, shall, after one day in air, develop a tensile strength of at least 300 pounds per square inch; and after one day in air and six days in water shall develop a tensile strength of at least 500 pounds per square inch; and after one day in air and twenty-seven days in water shall develop a tensile strength of at least 600 pounds per square inch. Other tests, as to fitness, constancy or volume, etc., made in accordance with the standard method prescribed by the American Society of Civil Engineers, may, from time to time, be prescribed by the commissioners of buildings.

The sand to be used must be clean, sharp grit, free from loam or dirt, and shall pass through a ¼-inch ring, or good gravel may be used in the same proportion as broken stone, or broken hard bricks, or terra-cotta, or furnace slag, or hard clean clinkers may be used.

The steel shall meet the requirements of this code.

Concrete-steel shall be designed in accordance with the following assumptions and requirements:

(1) The adhesion between the concrete and the steel is sufficient to make the two materials at least equal to the unit shearing strength of concrete.

(2) The design shall be based on the assumption of a load four times as great as the total working load (ordinary dead load plus ordinary live loads) producing a stress in the steel equal to the elastic limit and a stress in the concrete equal to 2,000 pounds per square inch.

(3) The modulus of elasticity of concrete at 2,000 pounds per square inch is equal to 1-18 of the modulus of elasticity of steel.

(4) The steel takes all the tensile stress.

(5) The stress-strain curve of concrete in compression, when the stress in the extreme fibre is 2,000 pounds per square inch, may be assumed.

(a) As a straight line.

(b) As a parabola with its axis vertical and its vertex on the neutral axis of the beam, girder or slab, or

(c) As an empirical curve with an area one-quarter greater than if it were a straight line, and with its center of gravity at the same height as that of the parabolic area assumed in (b).

(6) The assumption belonging to the common theory of flexure where not modified by any of the foregoing, will apply.

In the design of structures involving reinforced concrete girders and beams, as well as slabs, the girders and beams shall be treated as T-beams, with a portion of the slab acting as flange, in each case. The portion of the slab so acting shall be determined by assuming that in any horizontal-plane section of the flange, the stresses are distributed as the ordinates will be a subject for special consideration by the commissioner with its axis in a longitudinal vertical plane through the center of the rib of the T.

The shearing strength of concrete, corresponding to a compressive strength of 2,000 pounds per square inch, shall be assumed at 200 pounds per square inch.

All reinforced concrete T-beams must be reinforced against the shearing stress along the plane of junction of the rib and the flange. Where reinforced concrete girders carry reinforced concrete beams, the portion of the floor slab acting as flange to the girder must be reinforced with bars near the top, at right angles to the girder, to enable it to transmit local loads directly to the girder and not through the beams, thus avoiding an integration of compressive stresses due to simultaneous action as floor slab and girder flange.

Concrete indirect compression shall not be stressed, under the working load, more than 350 pounds per square inch. Reinforced compression members shall be designed on the assumption that this stress in the concrete will be simultaneous with one of 6,000 pounds per square inch in the steel.

In the execution of work in the field, work must be so carried on that the ribs of all girders and beams shall be monolithic with the floor slab.

In all reinforced concrete structures, special care must be taken with the design of joints to provide against local stresses and secondary stresses due to the continuity of the structure.

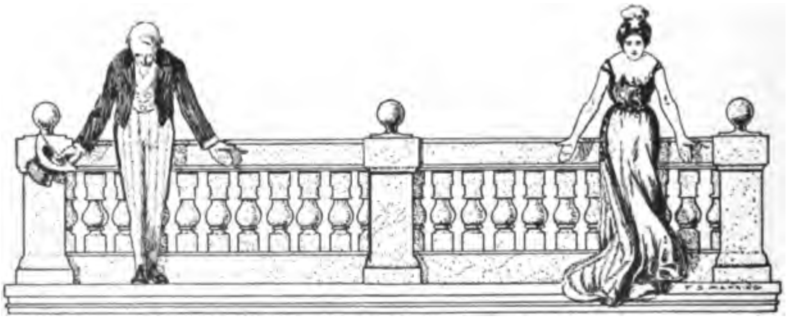
In the determination of the bending moments due to the external forces, beams and girders shall be considered as simply supported at the ends, no allowance being made for continuous construction over supports. Floor plates, when constructed continuous and when provided with reinforcement at the top of plate over the supports, may be treated as continuous beams, the bending moment for uniformity distributed loads being taken at not less than $\frac{W L}{10}$; the bending moment may be taken at $\frac{W L}{20}$ in the case of square floor plates which are reinforced in both directions and supported on all sides.

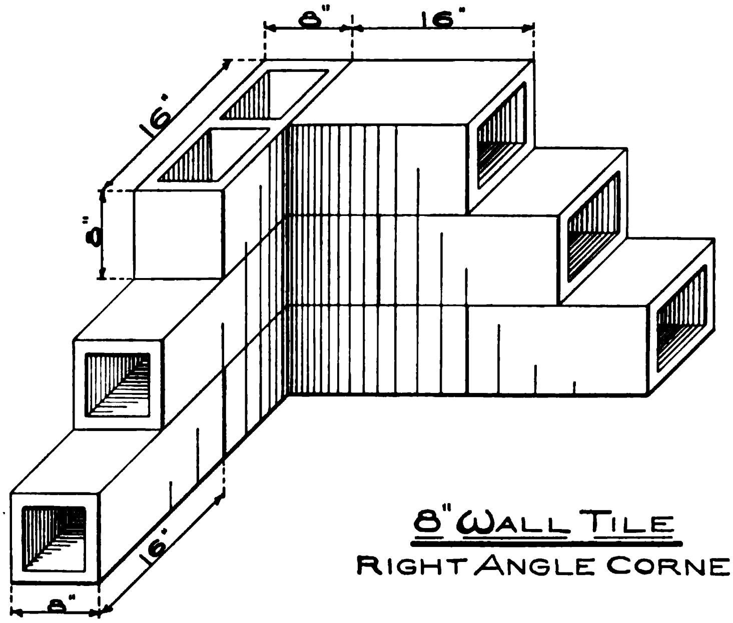
When the shearing stresses developed in any part of a reinforced concrete or concrete-steel constructed building exceed under the multiplied loads, the shearing strength as fixed in this section, a sufficient amount of steel shall be introduced in such a position that the deficiency in the resistance to shear is overcome.

When the safe limit of adhesion between the concrete and steel is exceeded, provision must be made for transmitting the strength of the steel to the concrete.

Concrete-steel may be used for columns in which the ratio of length to least side of diameter does not exceed twelve. The reinforcing rods must be tied together at intervals of not more than the least side or diameter of the column.

The contractor must be prepared to make load tests on any portion of a reinforced concrete or concrete-steel constructed building within a reasonable time after erection as often as may be required by the commissioner of buildings. The tests must show that the construction will sustain a load with a factor of safety for floors and structural members as required by this code.





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